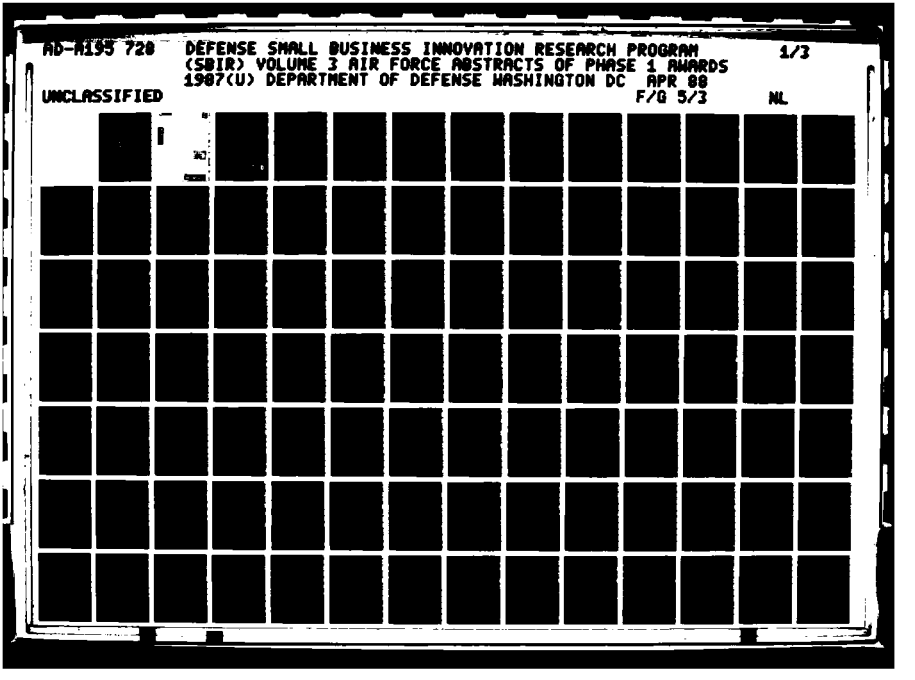
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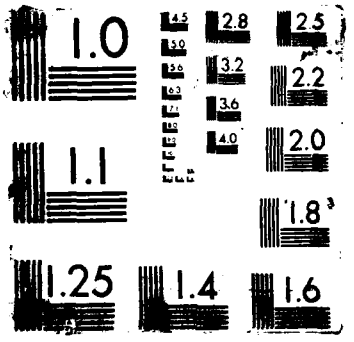
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VOLUME III

AIR FORCE PROJECTS

ABSTRACTS OF PHASE I AWARDS

FROM

FY 1987 SBIR SOLICITATION

April 1988

PREFACE

On July 31, 1987 Secretary of Defense Casper W. Weinberger announced the selection of small business firms proposals under Phase I of the Fiscal Year (FY) 1987 Department of Defense (DoD) Small Business Innovation Research (SBIR) Program to be funded upon successful completion of contract negotiations.

The selection of proposals for funding was made from proposals received by the Military Departments, the Defense Advanced Research Projects Agency (DARPA), the Defense Nuclear Agency (DNA), and the Strategic Defense Initiative Organization (SDIO) in response to the FY 1987 solicitation distributed on October 1, 1986 with a closing date of January 9, 1987.

FY 1987 Program

	Number of Topics	Proposals Received	Phase I Awards
Army	330	2402	331
Navy	263	2004	286
Air Force	241	1863	350
DARPA	33	395	59
DNA	8	200	25
SDIO	14	672	212
	889	7536	1263

In order to make information available on the technical content of the Phase I projects supported by the Department of Defense SBIR Program, this report presents, in four volumes, the abstracts of those proposals which have resulted in contract awards.

This is Volume III which contains abstracts and contacts for the 350 Phase I projects funded by the Air Force from the FY 1987 SBIR Program. Projects funded by other Department of Defense components are published in separate volumes as follows:

- Volume I - Army Projects (Pages 1 - 201)
- Volume II - Navy Projects (Pages 202 - 375)
- Volume IV - DARPA, DNA and SDIO Projects (Pages 588 - 788)

Venture capital and large industrial firms that may have an interest in the research described in the abstracts in this publication are encouraged to contact the SBIR firm whose name and address is shown.

INTRODUCTION

On July 22, 1982 the President signed the "Small Business Innovation Development Act of 1982" (Public Law 97-219). This law became effective October 1, 1982 and was designed to give small high technology firms a greater share of Federal R&D contract awards.

The SBIR Program consists of three distinct phases. Under Phase I, DoD Components make awards to small businesses, typically of one-half to one man-year effort over a period generally not to exceed six months, subject to negotiation. Phase I is to determine, insofar as possible, the scientific or technical merit and feasibility of ideas or concepts submitted in response to SBIR topics. All DoD topics address specific R&D needs to improve our defense posture. Proposals selected for contract award are those which contain an approach or idea that holds promise to provide an answer to the specific problem addressed in the topic. The successful completion of Phase I is a pre-requisite for further DoD support in Phase II.

Phase II awards will be made only to firms on the basis of results from the Phase I effort, and the scientific and technical merit of the Phase II proposal. In addition, proposals which identify a follow-on Phase III funding commitment from non-Federal sources will be given special consideration. Phase II awards will typically cover two to five man-years of effort over a period generally not to exceed 24 months, also subject to negotiation. The number of Phase II awards will depend upon the success rate of the Phase I effort and availability of funds. Phase II is the principal research or research and development effort, and will require a more comprehensive proposal which outlines the intended effort in detail.

Phase III is expected to involve private-sector investment and support for any necessary development that will bring an innovation to the marketplace. Also, under Phase III, DoD may award follow-on contracts not funded by the SBIR Program for products or processes meeting DoD mission needs.

Selection Criteria

Phase I proposals received in each topic area in the DoD solicitation brochure are evaluated on a competitive basis in the organization which generated the topic, by scientists and engineers knowledgeable in that area and in accordance with the following criteria:

1. The scientific/technical quality of the research proposal and its relevance to the topic description, with special emphasis on its innovation and originality.

2. Qualifications of the principal investigator, other key staff, and consultants, if any, and the adequacy of available or obtainable instrumentation and facilities.

3. Anticipated benefits of the research to the total DoD research and development effort.

4. Adequacy of the Phase I proposed effort to show progress toward demonstrating the feasibility of the concept.

The Act mandates that all Federal Agencies establish an SBIR program if their FY 1982 extramural budgets for R&D exceeded a threshold figure of $100 million. Beginning in FY 1983, DoD must make available the following percentages of its extramural R&D budget for this program:

	FY 1983	FY 1984	FY 1985	FY 1986	FY 1987	FY 1988
Percentage	0.1	0.3	0.5	1.0	1.25	1.25
Estimated Dollars	16.7M	43M	79M	150M	202M	221M
Actual Awarded Dollars	20.6M	44.6M	78.2M	150.7M	202M	

FY 1983 Program

	Number of Topics	Proposals Received	Phase I Awards	Phase II Awards
Army	182	1121	98	45
Navy	131	944	66	45
Air Force	75	496	99	49
DARPA	8	128	12	8
DNA	10	88	8	2
	406	2777	283	149

1984 Program

	Number of Topics	Proposals Received	Phase I Awards	Phase II Awards
Army	111	758	81	35
Navy	146	859	99	52
Air Force	283	1208	162	73
DARPA	17	107	15	7
DNA	8	80	12	1
	565	3012	369	168

FY 1985 Program

	Number of Topics	Proposals Received	Phase I Awards	Phase II Awards
Army	111	808	124	69
Navy	138	851	110	58
Air Force	218	1306	249	119
DARPA	17	130	14	6
DNA	7	95	18	6
SDIO	18	415	36	16
	509	3605	551	274

FY 1986 Program

	Number of Topics	Proposals Received	Phase I Awards	Phase II Awards
Army	225	1643	245	77
Navy	190	1222	225	81
Air Force	304	1795	306	132
DARPA	22	177	44	11
DNA	7	171	46	8
SDIO	12	552	154	38
	760	5560	1020	347

Public Law 99-443, the "Small Business Innovation Act of 1986" was signed by the President on October 6, 1986. This law re-authorized P.L. 97-219 to extend the "Sunset Clause" to 1993; to continue 1.25 percent taxation of the extramural research and development budget; and excludes from taxation those amounts of the DoD research and development budget obligated solely for operational systems development.

SUBMITTED BY

3C SYSTEMS INC
620 ARGYLE RD
WYNNEWOOD, PA 19096
CONTRACT NUMBER: 87-C-0363
MURRAY KORNHAUSER
TITLE:
IMPROVEMENT OF SMALL SCALE TESTING FOR EXPLOSIVE SENSI
TOPIC# 7 OFFICE: AFATL/MNE

THE OBJECTIVES OF PHASE I ARE TO DETERMINE HOW WELL THE SMALL SCALE TESTS CURRENTLY USED FOR SCREENING EXPLOSIVES, AND THE MODELS THAT DESCRIBE EXPLOSIVE BEHAVIOR IN THE SMALL SCALE TEST AND IN THE FULL SCALE MUNITION, CAN PREDICT THRESHOLDS OF EXPLOSIVE REACTION IN THE OPERATIONAL FULL SCALE MUNITION. FULL SCALE MUNITIONS WILL BE STUDIED TO DETERMINE THE CRITICAL MODE(S) OF EXPLOSIVE REACTION THAT WILL DICTATE WHICH KINDS OF SMALL SCALE TESTS WILL PRODUCE THE PERTINENT EXPLOSIVE SENSITIVITY DATA. DISCRETE ELEMENT MODELS OF THE SMALL SCALE TESTS AND THE OPERATIONAL MUNITION WILL BE APPLIED IN ORDER TO DEFINE THE EXPLOSIVE REACTION THRESHOLD COMMON TO BOTH SITUATIONS. AREAS OF PREDICTIVE DEFICIENCY WILL BE IDENTIFIED FOR A PHASE II IMPROVEMENT PROGRAM.

A.I. TECHNOLOGY INC
PO BOX 3081
PRINCETON, NJ 08543
CONTRACT NUMBER: F19628-87-C-0026
DR KEVIN K T CHUNG
TITLE:
ELECTRONIC EQUIPMENT SHELTERS
TOPIC# 29 OFFICE: ESD/XR

A NEW DESIGN CONCEPT FOR ELECTRONIC SHELTERS USING SOME OF THE ADVANCED MATERIALS SUCH AS CONDUCTIVE COMPOSITES, AND REINFORCED CONDUCTIVE SILICONE FABRICS WILL BE TESTED. THE MOST RELEVENT APPLICATION PARAMETERS SUCH AS CONDUCTIVITY OF THE COMPOSITES AND FABRICS, THE JOINING MECHANISM TO ENSURE ELECTROMAGNETIC COMPATIBILITY, THE FLEXIBILITY, THE TRANSPORTABILITY AND TOTAL SYSTEM WEIGHT WILL BE ADDRESSED IN DETAIL. THE GOAL IS TO DEVELOP A HIGHLY TRANSPORTABLE, LIGHT WEIGHT, DURABLE AND LOW MAINTENANCE SHELTERS TO

SUBMITTED BY

PROTECT MILITARY ELECTRONIC EQUIPMENT AGAINST ELECTROMAGNETIC INTERFERENCE, AND TO ASSURE THE ELECTROMAGNETIC PULSE SURVIVABILITY. IT IS EXPECTED THAT SUCH NEW SHELTER WILL BE ABLE TO PROVIDE MORE THAN 60 dB SHIELDING EFFECTIVENESS.

ACTA INC
24430 HAWTHORNE BLVD - STE 101
TORRANCE, CA 90505
CONTRACT NUMBER:
JON D COLLINS
TITLE:
DEVELOPMENT OF A MODEL FOR THE SYSTEM EFFECTIVENESS EV
OF ADVANCED BASING CONCEPTS
TOPIC# 204 OFFICE: BMO/MYSC

ACTA INC., USING KARAGOZIAN AND CASE AS A SUBCONTRACTOR, PROPOSES TO DEVELOP SPECIFICATIONS AND A COMPUTER PROGRAM WHICH CAN BE USED IN THE EVALUATION OF THE SYSTEM EFFECTIVENESS OF VARIOUS CANDIDATE ADVANCED BASING CONCEPTS. ACTA WILL MAKE USE OF SOFTWARE (ASTEP) WHICH IT HAS ALREADY DEVELOPED AS A BASIS FOR A PROGRAM WHICH CAN BE DELIVERED AT THE END OF PHASE I. THE PROGRAM CONCEPT WILL BE MODULAR AND FILE ORIENTED. IT WILL TAKE ADVANTAGE OF AN INNOVATIVE HYBRID ANALYTIC-MONTE CARLO TECHNIQUE WHICH SIGNIFICANTLY REDUCES COMPUTER SPACE REQUIREMENTS. IT WILL ALSO USE AN ACTA DEVELOPED "CONNECTIVELY ALGORITHM" THAT ADDS SIGNIFICANTLY TO THE CAPABILITY WHILE REDUCING THE SIZE OF THE SYSTEM FAILURE ANALYSIS PROBLEM. FRAGILITY AND STRUCTURAL RESPONSE MODELS WILL BE DEVELOPED FOR THOSE ELEMENTS (E.G. POTALS, SILOS AND SHALLOW TUNNELS) WHICH ARE NOT ALREADY PROGRAMMED AND AVAILABLE AT ACTA. THE PROGRAM WILL BE DESIGNED TO OPERATE ON A SMALL COMPUTER (IBM PC/AT). THE WORK WILL ALSO INCLUDE SPECIFICATION DEVELOPMENT FOR A FULL BASING SYSTEM EFFECTIVENESS MODELL (UTILIZING THE USAF AVAILABILLITY, DEPENDABILITY AND CAPABILITY DEFINITION) AND A COST EFFECTIVENESS MODEL.

ADVANCED COMPOSITE TECHNOLOGY INC
16002 W 4TH AVE
GOLDEN, CO 80401
CONTRACT NUMBER:
BRADFORD L WHATLEY
TITLE:
ELECTRONIC EQUIPMENT SHELTERS
TOPIC# 29 OFFICE: ESD/XR

SUBMITTED BY

THIS PROJECT WILL RESEARCH MATERIALS AND DEVELOP A DESIGN AND CONCEPT FOR MAKING ELECTRONIC EQUIPMENT SHELTERS USING ADVANCED MATERIALS. THE ADVANCED MATERIAL SHELTER WILL BE DESIGNED TO TAKE ADVANTAGE OF A NUMBER OF SIGNIFICANT ADVANCES IN MATERIALS AND PROPRIETARY TECHNOLOGICAL ADVANCES IN MANUFACTURING DEVELOPED BY ADVANCED COMPOSITE TECHNOLOGY, INC. (ACT). ACT HAS DEVELOPED TWO TECHNOLOGIES SIGNIFICANT FOR THIS PROJECT. THE FIRST TECHNOLOGY IS TO LAY WET LAMINATE FIBERS AT COMMERCIAL SPEEDS WHILE PRODUCING A SMOOTH PRODUCT WITH LOW VOIDS AT PRECISE ANGLES. THE SECOND TECHNOLOGY IS THE ABILITY TO LAY COMPLEX GEOMETRIC MATRIX PARTS USING ROBOTICS. THE ABILITY TO MANUFACTURE AT COMMERCIAL SPEEDS USING NON PREPREG MATERIALS ALLOWS FOR TAILORING A MATRIX USING DIFFERENT FIBERS WITHIN THE BUNDLE AND OFFERS POTENTIALLY MAJOR REDUCTIONS IN COSTS. NEW MATERIALS HAVE BEEN DEVELOPED THAT ACT BELIEVES WILL SATISFY THE AIR FORCE REQUIREMENTS FOR A COMPOSITE ELECTRONIC EQUIPMENT SHELTER. AS PART OF THIS PROPOSAL, ACT WILL INVESTIGATE USING A HIGH MODULUS POLYETHYLENE PRODUCT, SPECTRA 900 AND SPECTRA 1000, FOR THE OUTER SHELL. IN ADDITION TO THE LIGHTER WEIGHT, THE PRODUCT OFFERS SUPERIOR BALLISTIC PROTECTION WHEN COMPARED TO KEVLAR. THE PRODUCT OFFERS EXTREMELY LOW ELECTRICAL CONDUCTIVITY AND IT FLOATS. TO PROVIDE RFI INTEGRITY, AN INTERIOR WALL COULD BE MADE OF A PRODUCT SUCH AS NICKEL COATED GRAPHITE (NCG) OR A COMBINATION OF GRAPHITE AND METALLIC FIBERS TO FORM A MESH.

ADVANCED DIGITAL SYSTEMS INC
10052 MESA RIDGE CT - STE 200
SAN DIEGO, CA 92121
CONTRACT NUMBER: F33615-87-C-1467
WILLIAM HOFFMAN
TITLE:
SMART COMMUNICATIONS
TOPIC# 156 OFFICE: AFWAL/AA

THE OBJECTIVE OF THIS EFFORT IS TO EXPLORE THE POTENTIAL OF FINITE INDUCTIVE SEQUENCE PROCESSING (FISP) (A PROPRIETARY PROCESSING TECHNIQUE OWNED JOINTLY BY ADS AND CIS) TO PROVIDE AUTOMATED DECISIONS AND CONTROL REQUIRED TO EFFECT OPTIMUM EMPLOYMENT OF AIRCRAFT ONBOARD COMMUNICATIONS IN THE YEAR 2000 AND BEYOND. FISP IS AN ALGORITHMIC APPROACH TO A KNOWLEDGE BASED ARTIFICIAL INTELLIGENCE (AI)

SUBMITTED BY

SYSTEM WHICH DOES NOT REQUIRE THE COMPUTER STORAGE AND EXECUTION SPACE NORMALLY ASSOCIATED WITH A SYSTEM OF THIS TYPE. FISP EMPLOYS BOTH A DATA COMPRESSION ALGORITHM AND A PATTERN RECOGNITION ALGORITHM. WE BELIEVE FISP IS IDEAL AS AN ONBOARD DECISION AND CONTROL SYSTEM; IT WILL BE ABLE TO SENSE THE ELECTROMAGNETIC ENVIRONMENT, DEVICE OPTIMUM STRATEGIES, AND IMPLEMENT THE MOST APPROPRIATE COMMUNICATIONS SCHEME, IN REAL TIME.

ADVANCED MECHANICAL TECHNOLOGY INC
151 CALIFORNIA ST
NEWTON, MA 02158
CONTRACT NUMBER: F33615-87-C-2792
ELIA P DEMETRI
TITLE:
FLUIDIZED BED FOR PREVENTION OF FREEZING IN CRYOGENIC EXCHANGERS
TOPIC# 130 OFFICE: AFWAL/PO

A SERIOUS PROBLEM IN HEAT EXCHANGERS WHERE ATMOSPHERIC AIR IS COOLED TO CRYOGENIC TEMPERATURES IS THAT THE AMBIENT WATER VAPOR AND CO(2) FREEZE ONTO THE HEAT TRANSFER SURFACES. AS THE SOLID DEPOSITS ACCUMULATE THEY ADVERSELY AFFECT PERFORMANCE BY DECREASING HEAT EXCHANGER EFFECTIVENESS AND INCREASING PRESSURE DROP. AN INNOVATIVE APPROACH FOR DEALING WITH THE FREEZING PROBLEM WHICH OFFERS SIGNIFICANT POTENTIAL ADVANTAGES OVER CONVENTIONAL TECHNIQUES IS THE USE OF A FLUIDIZED BED HEAT EXCHANGER. AN EXPERIMENTAL AND ANALYTICAL PROGRAM IS PROPOSED TO INVESTIGATE THE TECHNICAL FEASIBILITY OF IMPLEMENTING THIS CONCEPT IN CRYOGENIC APPLICATIONS. PARAMETRIC TESTS WILL BE CONDUCTED ON LABORATORY-SCALE MODELS TO OBTAIN DETAILED EXPERIMENTAL DATA ON THE KEY TECHNICAL ISSUES RELATIVE TO THE APPLICABILITY OF THE CONCEPT. ANALYSIS AND CORRELATION OF THE TEST RESULTS WILL PROVIDE A DEFINITIVE ASSESSMENT OF FEASIBILITY AND WILL IDENTIFY THE SPECIFIC DEVELOPMENT REQUIREMENTS FOR EVENTUAL FULL-SCALE IMPLEMENTATION.

ADVANCED RESEARCH & APPLICATIONS CORP
425 LAKESIDE DR
SUNNYVALE, CA 94086
CONTRACT NUMBER:
R A ARMISTEAD
TITLE:
NDE FOR COMPOSITE STRUCTURES
TOPIC# 186 OFFICE: AFRPL/TSTR

SUBMITTED BY

THE TREND CONTINUES TOWARDS APPLYING ADVANCED COMPOSITE MATERIALS TO THE HIGH PERFORMANCE STRUCTURES ASSOCIATED WITH AEROSPACE. STRUCTURES FABRICATED FROM CARBON-CARBON AND FILAMENT WOUND COMPOSITES ARE PARTICULAR EXAMPLES. TO FULLY EXPLOIT THE PROMISE OF THESE ADVANCED STRUCTURES, NOVEL NDE TECHNIQUES ARE NEEDED FOR CHARACTERIZATION. DUAL-ENERGY LAMINOGRAPHY SPECIFICALLY ADDRESSES THE CHEMICAL, DIMENSIONAL, AND MATERIAL PROPERTIES OF THIN-WALLED, POROUS STRUCTURES. PHASE I WILL COMPUTATIONALLY AND EXPERIMENTALLY ASSESS AND DERIVE A LAMINOGRAPHIC NDE SYSTEM DESIGN WHICH SATISFIES THE CARBON-CARBON AND FILAMENT WOUND COMPOSITE STRUCTURE APPLICATION.

ADVANCED RESEARCH & APPLICATIONS CORP
425 LAKESIDE DR
SUNNYVALE, CA 94086
CONTRACT NUMBER: F33615-87-C-5273
DR JAMES H STANLEY
TITLE:
SUPERVOLTAGE NDE TECHNIQUES FOR LARGE AEROSPACE STRUCT
TOPIC# 94 OFFICE: AFWAL/ML

INNOVATIVE TECHNICAL APPROACHES FOR DETECTING AND CHARACTERIZING BULK DEFECTS IN LARGE AEROSPACE STRUCTURES ARE URGENTLY NEEDED. THE INTEGRITY OF BONDED SURFACES IN THE Y-JOINT AND RESTRICTER REGIONS OF LARGE SOLID BOOSTERS, SUCH AS TITAN 34D MOTORS, IS A GOOD EXAMPLE OF A CRITICAL APPLICATION WITHOUT A DEPENDABLE INSPECTION METHOD. IN FULLY ASSEMBLED T34D MOTORS, THESE ZONES, WHICH ARE THE MOST CRITICAL TO SYSTEM RELIABILITY, ARE ALSO THE MOST INACCESSIBLE TO STANDARD EXAMINATION TECHNIQUES. A COMPUTER TOMOGRAPHY (CT) SYSTEM WOULD IN THEORY BE ABLE TO PROVIDE AN INSPECTION CAPABILITY WHICH COULD ADDRESS THIS CRUCIAL QA PROBLEM, BUT THE SIZE AND OPACITY OF SOLID BOOSTERS PRECLUDES THE USE OF EVEN THE MOST ENERGETIC RADIATION SOURCES USED TO DATE. AN INNOVATIVE CT CONCEPT EMPLOYING BREMSSTRAHLUNG RADIATION WITH PEAK ENERGIES TWO TO FOUR TIMES AS GREAT AS THE HIGHEST EVER USED FOR CT IS PROPOSED. DESIGNATED SUPERVOLTAGE CT, THE NOVEL INSPECTION TECHNIQUE WOULD PROVIDE A UNIQUE CAPABILITY FOR DETERMINING THE IN-SITU INTEGRITY OF BONDED STRUCTURES IN LARGE AEROSPACE COMPONENTS. A SERIES OF MEASUREMENTS TO EVALUATE THE KEY TECHNICAL UNCERTAINTIES IN THE APPROACH AND TO THUS MAKE THE FIRST DEFINITIVE DETERMINATION OF EFFICACY OF THE CONCEPT IS PROPOSED.

SUBMITTED BY

AEREON CORP
TWENTY NASSAU ST
PRINCETON, NJ 08542
CONTRACT NUMBER: F19628-87-C-0145
DAVID F THOMPSON
TITLE:
LOW DENSITY STRUCTURE FOR AIRBORNE PLATFORMS
TOPIC# 36 OFFICE: ESD/XR

DEFINITIONS ARE REQUIRED OF STRUCTURAL WEIGHT FRACTIONS FOR DELTOID AEROBODY PLATFORMS IN ORDER TO ASSESS THEIR POTENTIAL. PRIOR DATA ON CONVENTIONAL AIRPLANES AND ZEPPELINS CANNOT BE INTERPOLATED OR EXTRAPOLATED WITH CONFIDENCE TO PROVIDE THE REQUIRED DEFINITION. THEREFORE, STRUCTURAL DESIGN STUDIES WILL BE MADE ESPECIALLY FOR THIS SHAPE, MASS DISTRIBUTION AND AIRLOAD. MODERN HIGH-STRENGTH AND STIFFNESS COMPOSITE MATERIALS WILL BE USED. ALSO EFFECTS OF MORE FAVORABLE MASS DISTRIBUTIONS WILL BE CONSIDERED. STRUCTURAL WEIGHT FRACTIONS WILL BE FORMULATED FOR THE SO-DEFINED CONCEPTS, INCLUDING THEIR SIZE AND SPEED DEPENDENCY. FEASIBILITY AND EFFECTIVENESS OF THESE VEHICLES WILL BE ASSESSED PRELIMINARILY ON THIS BASIS. PHASE II PLANS AND A FINAL REPORT WILL CONCLUDE THIS PHASE I, FIVE MONTH STUDY.

AERODYNE PRODUCTS CORP
5 TREBLE COVE RD
NORTH BILLERICA, MA 01862
CONTRACT NUMBER: F33615-87-C-3012
DR MORTON CAMAC
TITLE:
NO(2) CHEMILUMINESCENT IMAGING FOR LOW DENSITY FLOW VI
AND VELOCITY MEASUREMENT
TOPIC# 119 OFFICE: AFWAL/FI

*APPENDIX "B" NOT RECEIVED

AEROSPACE DESIGN & DEVELOPMENT INC
PO BOX 672
NIWOT, CO 80544
CONTRACT NUMBER:
DR HAROLD L GIER
TITLE:
THERMODYNAMIC VENT SYSTEM (TVS) OPTIMIZATION
TOPIC# 190 OFFICE: AFRPL/TSTR

SUBMITTED BY

THE OPERATIONS OF A THERMODYNAMIC VENT SYSTEM (TVS) WILL BE INVESTIGATED WITH THE GOAL OF OPTIMIZING THE PERFORMANCE OF THE CRYOGENIC STORAGE SYSTEM FOR LONG TERM STORAGE. A TEN YEAR STORAGE LIFE IS THE ULTIMATE GOAL TO BE ACHIEVED. THE EFFECTS OF THE VENTED GAS ON IMPROVING THE PERFORMANCE OF A MULTILAYER INSULATION SYSTEM WILL BE OPTIMIZED BY VARIATION OF PARAMETERS. THE OBJECTIVE IS TO MINIMIZE THE HEAT LOAD ON THE CRYOGENIC PRESSURE VESSEL AND THUS MINIMIZE THE CRYOGEN OUTFLOW. THE THERMODYNAMIC CYCLE OF A JOULE-THOMSON EXPANSION VALVE IN THE VENT SYSTEM WILL BE SELECTED FOR THE OPTIMAL EFFECT ON THE THERMAL PERFORMANCE. FOR HYDROGEN THE POTENTIAL GAINS IN PERFORMANCE OF THE VENT SYSTEM BY UTILIZING THE ENERGY OF THE PARA-TO-ORTHO PHASE CONVERSION WILL BE INVESTIGATED.

AEROSPACE SYSTEMS INC (ASI)
121 MIDDLESEX TURNPIKE
BURLINGTON, MA 01803
CONTRACT NUMBER:
JOHN ZVARA
TITLE:
COMPRESSIBLE FLUID DYNAMICS TO FIELD-MATTER INTERACTIO
VACUUM SPACE SCALAR VELOCITY POTENTIAL TO GENERATE FOR
TOPIC# 192 OFFICE: AFRPL/TSTR

THE PROJECT OBJECTIVE IS TO IDENTIFY PROMISING DYNAMIC FIELD-MATTER INTERACTIONS WITH THE SCALAR VELOCITY POTENTIAL OF VACUUM SPACE BY USING THE THEORY OF COMPRESSIBLE FLUID DYNAMICS AND TO SELECT THE GEOMETRY WITH THE OPTIMUM COEFFICIENT OF PERFORMANCE FOR EXPERIMENTAL VERIFICATION. THE ZERO POINT QUANTUM DYNAMIC ENERGY SINGULARITIES OF VACUUM SPACE WILL BE TREATED IN STATISTICAL MECHANICS FASHION TO OBTAIN TRANSPORT PROPERTIES AND ALLOW TREATMENT AS A COMPRESSIBLE FLUID MEDIUM. SPECIAL EMPHASIS IS PLACED ON THE DETERMINATION OF THE PHYSICAL VALUE OF THE ENERGY DENSITY OF VACUUM SPACE, BECAUSE IT DEFINES THE MAGNITUDE OF VECTOR FORCES THAT CAN BE GENERATED. IT IS INTENDED TO MODEL THE FIELDS OF GRAVITATION, ELECTROMAGNETISM AND STRONG AND WEAK INTERACTION IN TERMS OF THE FLUID DYNAMIC SPACE-TIME DERIVATIVES OF THE VACUUM SPACE ENERGY SCALAR VELOCITY POTENTIAL. FORCES AND MOMENTS OF INTERACTION BETWEEN COLINEAR FLOW, CYLINDRICAL VORTEX FLOW, TOROIDAL FLOW, SPHERICALLY SYMETRIC SINK AND SOURCE FLOW AND PERIODIC FLOW WILL BE IDENTIFIED AND QUANTIZED, SUBJECT TO

SUBMITTED BY

IMPOSED FIELD-MATTER BOUNDARY CONDITIONS. ONLY BY COUPLING A CONVENTIONAL FIELD TO A MATTER GEOMETRY WILL A THEORETICALLY DEMONSTRATED INTERACTION OF THE CONVENTIONAL FIELD WITH VACUUM SPACE BE ABLE TO MANIFEST ITSELF BY MEASURABLE EFFECTS ON THE MATTER GEOMETRY.

AIRSPACE TECHNOLOGY CORP
9 GOODYEAR
IRVINE, CA 92718
CONTRACT NUMBER:
DAVID B WHITNEY
TITLE:
AUTOMATED AIR TRAFFIC CONTROL SYSTEM CONCEPTS
TOPIC# 32 OFFICE: ESD/XR

FUTURE MILITARY AIR TRAFFIC CONTROL (ATC) SYSTEMS WILL USE TECHNOLOGIES SIGNIFICANTLY ADVANCED OVER TODAY'S EQUIPMENTS. THE SYSTEM WILL BE PASSIVE IN THAT THEY WILL USE AIRCRAFT DERIVED POSITION DATA IN LIEU OF PRIMARY AND SECONDARY RADAR DATA. IT WILL BE HEAVILY RELIANT ON AUTOMATED AND SEMI-AUTOMATED PROCESSING TECHNIQUES FOR TRACKING, ROUTING AND THE OTHER BASIC CONTROL FUNCTIONS. THE CONTROLLER'S ACTIVITIES WOULD BE CONTROL BY EXCEPTION. DATA LINKS WOULD PERFORM THE A/G COMMUNICATION TASKS. THE SYSTEM WOULD HAVE MORE INTEROPERABILITY WITH BATTLEFIELD MANAGEMENT SYSTEMS (BMS) THAN IS PRESENTLY DONE BY CONVENTIONAL ATC SYSTEM. THIS PROPOSAL WILL ADDRESS TWO APPROACHES TOWARD DEVELOPING THE ADVANCED ATC SYSTEM (AATCS). ONE WILL BE THE INVESTIGATION OF TECHNOLOGIES INCORPORATED INTO EXISTING OR PLANNED TACTICAL AND STRATEGIC BMS. THIS TO EVALUATE THEIR POTENTIAL APPLICATION TO AATCS WITH THE AIM OF MAKING AATCS AN INTEGRAL PART OF THE OVERALL BMS. THE SECOND APPROACH WILL INVESTIGATE THE PRACTICABILITY OF A STAND ALONE AATCS, USING SIMILAR TECHNOLOGIES, BUT FUNCTIONING AS AN INDEPENDENT ATC SYSTEM INTERFACED WITH THE BMS. THE OBJECTIVE OF THIS PHASE I EFFORT WILL BE TO DEVELOP A BASIC SYSTEM CONCEPT THAT CAN BE DEMONSTRATED UNDER A PHASE II PROGRAM.

AMAS CONSORTIUM
1309 RUBIO VISTA RD
ALTADENA, CA 91001
CONTRACT NUMBER: F33615-87-C-2161
THOMAS J RATH
TITLE:
ADVANCED MANNED AERIAL SCOUT
TOPIC# 160 OFFICE: ASD/XR

SUBMITTED BY

THE ADVANCED MANNED AERIAL SCOUT (AMAS) PROJECT ISA PHASE PROGRAM TO DEFINE AND DEVELOP A MODERN, LIGHT, FIXED-WING AIRCRAFT TO BE THE LINCHPIN OF COMBINED-ARMS OPERATIONS AND DOMINATE THE LOW-ALTITUDE BATTLEFIELD ARENA. IT IS INTENDED NOT ONLY TO REPLACE EXISTING OBSERVATION AIRCRAFT, BUT ALSO TO SUPPLANT THE CURTAILED OH-58D PROGRAM, COMPLIMENT THE LHX, ACAF, AND INTERIM CAS PROGRAM, AND MAKE POSSIBLE TRUE COMBINED-ARMS, MANEUVER WARFARE. PHASE I WILL CONSIST OF THREE FOCUSED PAPERS ANALYZING (1) THE LOW-ALTITUDE BATTLEFIELD ARENA AND THE "INDIAN TERRITORY" BENEATH IT; (2) THE CAPABILITIES AND LIMITATIONS OF AVAILABLE AND PROJECTED AVIONICS, OPTRONICS, DISPLAYS AND OTHER TECHNOLOGIES HAVING A DIRECT RELATIONSHIP TO C3I REQUIREMENTS; AND (3) TECHNOLOGICAL ADVANCES WHICH WOULD CONTRIBUTE TO A COMBAT VIABLE AIRFRAME. THE THREE RESULTING MODEL MATRIXES WILL BE CORRELATED TO DEFINE THE PARAMETERS AND CHARACTERISTICS OF A COMPLETE WEAPONS SYSTEM WHICH CAN PERFORM ALL THE NECESSARY C3I BATTLEFIELD FUNCTIONS OF A COMBINED-ARMS ACTION IN REAL-TIME AND IN DIRECT CONTACT WITH THE ENGAGED FORCES.

AMERASIA TECHNOLOGY INC
620-1 HAMPSHIRE RD
WESTLAKE VILLAGE, CA 91361
CONTRACT NUMBER:
DR EDWARD J STAPLES
TITLE:
LOW COST HIGH RELIABILITY HRG
TOPIC# 202 OFFICE: BMO/MYSC

THIS PROPOSAL ADDRESSES THE DEVELOPMENT OF AN INNOVATIVE STRAPDOWN GYRO, THE HEMISPHERICAL RESONATOR GYRO (HRG). THE HRG OFFERS IMPROVED ROTATION SENSING WITH SIMPLIFIED SYSTEM MECHANIZATION, HIGHER RELIABILITY AND IMPROVE LIFE CYCLE COST FOR INERTIAL NAVIGATION SYSTEMS FOR BALLISTIC MISSILES, RE-ENTRY VEHICLES, AND INTERCEPTORS. PROTOTYPE HRGs HAVE DEMONSTRATED OVERALL DRIFT RATES OF 0.003 DEG/HR. INCLUDING THE EFFECTS OF A MILITARY TEMPERATURE RANGE. THE HRG IS WELL SUITED TO STRAPDOWN APPLICATIONS SINCE IT HAS VIRTUALLY UNLIMITED ANGULAR RATE CAPABILITY TOGETHER WITH EXTREMELY HIGH SCALE FACTOR STABILITY AND LOW INHERENT DYNAMIC SENSITIVITY. INTERNALLY IT DISSIPATES ONLY 12 MICROWATTS AND A CLUSTER OF THREE GYROS INCLUDING ELECTRONICS CAN BE PACKAGED IN LESS THAN 3 IN(3). LACKING

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ANY WEAROUT MECHANISM IMPLIES LONG OPERATING LIFE AND HIGH RELIABILITY. THE OBJECTIVE OF THE PHASE I PROGRAM IS TO ASSESS THE PERFORMANCE OF THE HRG AS A RATE SENSOR FOR INERTIAL GUIDANCE SYSTEMS. A PERFORMANCE MODEL BASED ON SENSOR PHYSICS AND EXPERIMENTAL DATA IS PROPOSED. ACCURACY, DRIFT RATE, RELIABILITY, AND SYSTEM LIFE CYCLE COST SHALL BE ESTABLISHED BASED UPON SUBSYSTEM ERROR BUDGETS.

AMERICAN RESEARCH CORP OF VA
PO BOX 3406 - 642 FIRST ST
RADFORD, VA 24143
CONTRACT NUMBER: F33615-87-C-3235
DR ADEL SARRAFZADEH
TITLE:
LASER SPECKLE INSTRUMENT WITH HAND-HELD PROBING HEAD F NONCONTACTING INSPECTION OF ADVANCED MATERIALS
TOPIC# 109 OFFICE: AFWAL/FI

THE MATERIALS OF AEROSPACE COMPONENTS ARE SUBJECTED TO HIGH TEMPERATURES AND STRONG AERODYNAMIC FORCES DURING PROPULSION. THEREFORE, INNOVATIONS IN NON-INVASIVE SENSOR TECHNOLOGIES ARE REQUIRED FOR THE MEASUREMENT OF STRUCTURAL PHYSICAL PROPERTIES. FIBER OPTIC VIEWING PROBES AND OTHER OPTICAL MEASURING TECHNIQUES, ALTHOUGH PROMISING, FAIL TO COMBINE FLEXIBILITY WITH QUANTITATIVE ANALYSIS OF PHYSICAL MEASUREMENTS AT THE VERY HIGH TEMPERATURES (" 400 DEG F) ENCOUNTERED IN NEW ADVANCED SYSTEMS SUCH AS SCRAMJET ENGINES AND AEROSPACE REENTRY VEHICLES. THE TARGET OF OPPORTUNITY IN THIS PROGRAM IS THE DEVELOPMENT OF A NONCONTACTING, HIGHLY SENSITIVE, OPTICAL STRAIN MEASUREMENT TECHNIQUE WHICH USES A LASER SPECKLE INTERFEROMETRIC SENSOR WITH ASSOCIATED DIGITAL OPTOELECTRONIC IMAGE PROCESSING EQUIPMENT. THE SYSTEM WILL PROVIDE A RAPID CORRELATION SIGNAL USED FOR THE MICROSTRUCTURAL CHARACTERIZATION OF MATERIALS SUBJECTED TO VERY HIGH TEMPERATURES. SPECIFIC PROGRAM OBJECTIVES INCLUDE THE EVALUATIONS OF TYPICAL AEROSPACE MATERIALS FOR THEIR SPECTRAL EMISSIVITY, THE ASSESSMENT OF CURRENTLY AVAILABLE HIGH-TEMPERATURE STRAIN MEASUREMENT TECHNIQUES, THE DESIGN AND DEVELOPMENT OF VERY HIGH-TEMPERATURE AND HIGHLY SENSITIVE STRAIN SENSOR BASED ON A UNIQUE LASER SPECKLE INSTRUMENTATION AND DIGITAL OPTOELECTRONIC SIGNAL PROCESSING.

AMERICAN SCIENCE & ENGINEERING INC
FORT WASHINGTON
CAMBRIDGE, MA 02139
CONTRACT NUMBER: F19628-87-C-0124
RICHARD MASTRONARDI
TITLE:
QUALITY ASSURANCE OF SURFACE MOUNTED PRINTED CIRCUIT B ASSEMBLY SOLDER JOINTS
TOPIC# 28 OFFICE: ESD/XR

SUBMITTED BY

A HIGH SPATIAL RESOLUTION AND HIGH SENSITIVITY X-RAY IMAGING SYSTEM HAS BEEN DEVELOPED THAT IS APPROPRIATE FOR THE IN-PROCESS INSPECTION OF SURFACE MOUNTED PRINTED CIRCUIT BOARD ASSEMBLIES. IT IS A NEAR REAL-TIME SYSTEM THAT PRODUCES HIGH-QUALITY DIGITAL IMAGES CAPABLE OF PROVIDING QUANTITATIVE DATA FOR FEEDBACK TO THE ASSEMBLY SOLDERING AND OTHER SURFACE MOUNTED TECHNOLOGY MANUFACTURING PROCESSES. THIS TECHNOLOGY OFFERS DISTINCT ADVANTAGES OVER CONVENTIONAL METHODS SUCH AS FILM AND FLUOROSCOPIC X-RAY RADIOGRAPHY, WHICH HAS BEEN USED IN THE PAST. OUR APPROACH TO SCAN THE ARTICLE USES A FAN BEAM ILLUMINATION OF THE TEST OBJECT AND A LINEAR ARRAY OF DETECTOR ELEMENTS. THE PATENTED DETECTOR CONFIGURATION IS THE KEY TO THE SYSTEM'S IMPRESSIVE PERFORMANCE. IT HAS BEEN DEMONSTRATED THAT DEFECTS AS SMALL AS 25 MICRONS (0.001 INCH) CAN BE DETECTED. IT IS OUR INTENT UNDER THIS PROGRAM, TO EXPLORE THE USE OF THIS NEW AND POWERFUL X-RAY INSPECTION TECHNOLOGY AS AN IMPORTANT PART OF A FEEDBACK LOOP IN AN INTEGRATED QUALITY ASSURANCE SYSTEM FOR OVERALL SOLDER JOINT EVALUATION OF SURFACE MOUNTED PRINTED CIRCUIT BOARD ASSEMBLIES.

AMERICAN SCIENCE & ENGINEERING INC
FORT WASHINGTON
CAMBRIDGE, MA 02139
CONTRACT NUMBER:
DR PAUL J BJORKHOLM
TITLE:
ZT IMAGING FOR LAYERED THIN WALL STRUCTURES
TOPIC# 186 OFFICE: AFRPL/TSTR

CARBON-CARBON AND FILAMENT WOUND COMPOSTIES NOT ONLY OFFER UNIQUE MECHANICAL PROPERTIES AND CAPABILITIES, BUT ARE DIFFICULT TO INSPECT AND DETERMINE MANUFACTURING INTEGRITY. DEFECTS OF INTEREST ARE VARIATIONS IN DENSITY AND CHEMICAL SPECIES, VOIDS, AND CRACKS. A NEW IMAGING TECHNOLOGY, ZT, HAS BEEN DEVELOPED WHICH IS INTRINSICALLY TOMOGRAPHIC, IMAGES IN PLANES PARALLEL TO THE OBJECT SURFACE, AND IS SENSITIVE TO CHEMICAL SPECIES AND DENSITY. IT IS THE OPTIMAL IMAGING TECHNIQUE FOR THE DEFECTS AND MATERIALS OF INTEREST HERE. PHASE I WILL CONSIST OF UTILIZING EXISTING EQUIPMENT TO SCAN PARTS SUPPLIED BY THE AIR FORCE ROCKET PROPULSION LABORATORY (AFRPL) IN ORDER TO DEMONSTRATE THE FEASIBILITY AND SENSITIVITY. IT IS EXPECTED THAT THE PARTS SUPPLIED WILL HAVE THE FOLLOWING DEFECTS AT A MINIMUM: DELAMI-

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NATIONS (1cm X 1cm FRONTAL AREAS, 1000, 500, 250, AND 125 MICRONS THICK), DENSITY VARIATIONS (1cm X 1cm FRONTAL AREA, 10, 5, 2, 1, AND 0.5%), AND POROSITIES (HOLE SIZES TO VARY AND THEIR DENSITY TO VARY TO CAUSE SIMILAR OVERALL DENSITY VARIATIONS AS INDICATED FOR THE DENSITY VARIATION SAMPLES). IN ADDITION PHASE I WILL INCLUDE AN ENGINEERING STUDY THAT WILL IDENTIFY MODIFICATIONS TO OUR STANDARD SYSTEMS THAT ARE REQUIRED TO OPTIMIZE THE ZT TECHNIQUE FOR THE PROBLEM OF INTERTEST. PHASE II WILL PRODUCE A PROTOTYPE SYSTEM THAT COULD BE USED IN A LABORATORY SETTING.

AMHERST SYSTEMS INC
30 WILSON RD
BUFFALO, NY 14221
CONTRACT NUMBER:
CESAR BANDERA
TITLE:
SOFTWARE ENGINEERING FOR NON-VON NEUMANN ARCHITECTURES
TOPIC# 50 OFFICE: RADC/XPX

CURRENT COMPUTER SYSTEM APPLICATIONS FEATURE CONTINUALLY INCREASING COMPUTATIONAL RESOURCE REQUIREMENTS WHICH HAVE BECOME UNFEASIBLE OR UNREALIZEABLE USING CONVENTIONAL VON NEUMANN UNIPROCESSOR TECHNIQUES. NON-VON NEUMANN ARCHITECTURES FEATURING MULTIPLE PROCESSING ELEMENTS OFFER SOLUTIONS THAT ACHIEVE THE APPLICATION REQUIREMENTS. HOWEVER, SOFTWARE ENGINEERING TECHNOLOGY REMAINS ORIENTED TOWARDS VON NEUMANN METHODOLOGIES. THIS, COUPLED WITH THE APPLICATIONS SPECIFIC NATURE OF NON-VON NEUMANN ARCHITECTURES, HAS RESULTED IN A FRAGMENTED SOFTWARE ENGINEERING ENVIRONMENT. CONSEQUENTLY, SYSTEM DEVELOPMENT CAN BE SUBOPTIMAL OR EVEN UNSUCCESSFUL. THIS STUDY FOCUSES ON THE IDENTIFICATION OF THE SYSTEM AND SOFTWARE LIFE CYCLES OF CURRENT NON-VON NEUMANN ARCHITECTURES. INDIVIDUAL ARCHITECTURES AND ASSOCIATED SOFTWARE ENGINEERING TOOLS AND METHODOLOGIES WILL BE IDENTIFIED AND ASSESSED. THESE INDIVIDUAL SOFTWARE ENGINEERING TECHNOLOGIES WILL THEN BE CORRELATED TO GENERATE THE POLICIES AND TECHNOLOGICAL DATABASE OF A UNIFIED NON-VON NEUMANN SOFTWARE ENGINEERING METHODOLOGY. THE RESULTS OF THIS STUDY WILL SUPPORT CURRENT AND FUTURE APPLICATIONS PROGRAMS BY PROVIDING GROUND RULES TO ARCHITECTURE SELECTION AND SYSTEM AND SOFTWARE LIFE CYCLE DEFINITION. THE STUDY WILL ALSO PROVIDE A COMPREHENSIVE LIST OF CURRENT SOFTWARE ENGINEERING

SUBMITTED BY

TECHNOLOGIES FOR MORE EFFICIENT APPLICATIONS PROGRAM IMPLEMENTATION.

ANADIGICS INC
35 TECHNOLOGY DR
WARREN, NJ 07060
CONTRACT NUMBER: F33615-87-C-1493
PHILLIP W WALLACE
TITLE:
ON-WAFER TESTING OF MONOLITHIC MICROWAVE INTEGRATED CI
TOPIC# 140 OFFICE: AFWAL/AA

WAFER PROBING IS THE CRITICAL LINK BETWEEN WAFER FABRICATION, AND DEVICE PACKAGING OR HYBRID SUBSYSTEM INSERTION. FOR GaAs MMICs TO BE COST EFFECTIVE, THEY MUST BE TESTED IN A MANNER THAT IS RELIABLE, FAST, AND EFFICIENT. THIS PROPOSAL DESCRIBES A PROGRAM TO DEVELOP EQUIPMENT AND TECHNIQUES FOR HIGH RATE, HIGH VOLUME MMIC WAFER PROBING. PHASE I OF THIS PROGRAM WILL INCLUDE AN EXPERIMENT USING EXISTING EQUIPMENT AND MMICs, AND RESEARCH TO DEFINE THE PRESENT STATE-OF-THE-ART, TO IDENTIFY THOSE AREAS WHICH MUST BE APPROACHED. HARDWARE COMPATIBLE WITH ACCURATE, HIGH-SPEED MICROWAVE TESTING, AND TECHNIQUES FOR INTERFACING THIS EQUIPMENT TO MMICs ON-WAFER WILL BE INVESTIGATED. REDUCING THE COST OF THE FINAL MMIC DEVICE BY EFFECTIVE SORTING OF DIE IS THE PRIMARY OBJECTIVE OF THIS WORK.

ANALYSIS & COMPUTER SYSTEMS INC
54 MIDDLESEX TURNPIKE
BEDFORD, MA 01730
CONTRACT NUMBER:
CHARLES MORRISON
TITLE:
ANALYSIS/DEMONSTRATION OF ADVANCED AIR TRAFFIC CONTROL
TOPIC# 32 OFFICE: ESD/XR

THIS SOLICITATION RESPONSE DESCRIBES ACSI'S TEAM APPROACH IN DEFINING, ANALYZING AND EVALUATING THE FEASIBILITY OF THE NEW CONCEPTS PROPOSED FOR PERFORMING AIR TRAFFIC CONTROL (ATC) IN A TACTICAL WARTIME ENVIRONMENT. WE WILL SHOW HOW WE PROPOSE TO DEVELOP THE CONCEPTS SO THAT TERMINAL ATC SERVICES CAN BE MADE SAFE AND SURVIVABLE

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BY UPGRADING CURRENT EQUIPMENT TO INCORPORATE TECHNOLOGIES WHICH REDUCE OR ELIMINATE RELIANCE ON HIGH POWERED EMITTERS (E.G. RADAR) AND UHF/VHF RADIO COMMUNICATION. WE PROPOSE TO ADVANCE AND REFINE EXISTING RESEARCH AND DEVELOPMENT (R&D) CONCEPTS IDENTIFIED AS AUTOMATED TACTICAL AIRCRAFT LAUNCH AND RECOVERY SYSTEM (ATALARS). WE WILL SPECIFY IN PHASE I HOW A PROOF-OF-CONCEPT DEMONSTRATION CAN BE PERFORMED IN PHASE II ON THE ENHANCED JTIDS SYSTEM EXERCISER (EJSE). THE EJSE WAS DEVELOPED BY ACSI FOR THE USAF TO SUPPORT JTIDS - A RELIABLE AND SECURE DIGITAL LINK NETWORK WHICH EXCHANGES DATA AT HIGH RATES AMONG A NETWORK OF AIR-BASED AND GROUND TERMINALS. WE WILL DEFINE AND INCORPORATE IN THE EJSE NEW TADIL J DATA LINK MESSAGES REQUIRED TO CONVEY TERMINAL ATC SERVICES. WE WILL INCORPORATE A SUBSET OF ATC ALGORITHMS FOR A SINGLE GROUND CONTROL UNIT (GCU) IN THE EJSE AND THEN DEVELOP A SIMULATION DEMONSTRATING THE EFFECTIVENESS OF THE ATALARS CONCEPT IN ENHANCING ATC SERVICES.

ANALYTIC BIOPHYSICS CORP
1275 PALAMOS AVE
SUNNYVALE, CA 94089
CONTRACT NUMBER:
JAMES A FREEMAN
TITLE:
NON CONTACT EEG ELECTRODES
TOPIC# 77 OFFICE: AMD/RDO

ANALYTIC BIOPHYSICS CORPORATION HAS DEVELOPED NON CONTACT ELECTRODES FOR ELECTROCARDIOLOGY (PATENT PENDING). WE PROPOSE TO EXTEND THIS TECHNOLOGY TO THE HIGHER SENSITIVITY LEVEL REQUIRED FOR EEG. IN STAGE I WE PROPOSE TO CONSTRUCT AND EVALUATE A HELMET CONTAINING FOUR NON CONTACT EEG ELECTRODE CHANNELS. THE OUTPUTS OF THESE FOUR CHANNELS WOULD BE RECORDED AND COMPARED WITH FOUR SIMULTANEOUSLY RECORDED STANDARD HARD WIRE ELECTRODE CHANNELS. INCLUDED IS A REVIEW OF THE PROBLEMS ASSOCIATED WITH NON CONTACT EEG ELECTRODE TECHNOLOGY. WE CONCLUDE THAT NO COMMERCIALLY AVAILABLE AMPLIFIERS OR INTEGRATED CIRCUITS ARE CAPABLE OF ACHIEVING THIS TASK. THE PRINCIPAL INVESTIGATOR HAS DEVELOPED A PROPRIETARY ULTA LOW NOISE AMPLIFIER TECHNOLOGY. WE FEEL THIS UNIQUE TECHNOLOGY IS A NECESSITY FOR SUCCESSFUL ACHIEVEMENT OF THIS GOAL.

ANALYTICS INC
2500 MARYLAND RD
WILLOW GROVE, PA 19090
CONTRACT NUMBER:
PAUL R SAUNDERS
TITLE:
DIAGNOSTIC RULES GENERATOR
TOPIC# 88 OFFICE: AMD/RDO

SUBMITTED BY

THE NEED TO APPLY EXPERT KNOWLEDGE IN THE INTERPRETATION OF MEDICAL IMAGERY AND SENSOR DATA IS WELL DOCUMENTED. RULE-BASED EXPERT SYSTEMS HAVE PROVEN THEIR VALUE IN SUCH APPLICATIONS AS MEDICAL EXPERTISE. MOST DIAGNOSTIC SYSTEMS MIMIC THE CONSULTING-ROOM ENVIRONMENT, ACQUIRING SYMPTOM DESCRIPTIONS AND LAB FINDINGS THROUGH DIALOG WITH THE USER. AUTOMATED DIAGNOSIS FROM IMAGERY AND ANALOG IS A MORE DIFFICULT PROBLEM. THE PROPOSED EFFORT SEEKS TO ADVANCE THE FIELD BY ADDRESSING KNOWLEDGE ACQUISITION PROBLEMS IN APPLYING EXPERT SYSTEMS TECHNOLOGY TO IMAGERY AND SIGNAL DATA. THIS PROBLEM CAN BE ADDRESSED BY AN EXPERT SYSTEM THAT WRITES RULE BASES. SIMILAR TO A KNOWLEDGE ENGINEER, A RULE-WRITING SYSTEM LEARNS WHAT THE EXPERT KNOWS. WE PROPOSE A PROGRAM OF RESEARCH TO DEVELOP A SYSTEM CALLED METARULE THAT WILL ADVANCE THE STATE-OF-THE-ART IN KNOWLEDGE BASED SYSTEMS--SPECIFICALLY, IN THE AREAS OF MACHINE LEARNING AND KNOWLEDGE REPRESENTATION; LEAD TO THE DEVELOPMENT OF A COMMERCIALLY VIABLE INDUCTIVE REASONING SYSTEM INCORPORATING THE ADVANCES REQUIRED TO DEAL WITH IMAGERY AND SIGNALS; AND ENABLE EXPERT SYSTEMS TO BE DEVELOPED THAT WOULD OTHERWISE BE INFEASIBLE--INCLUDING NON-SIGNALS EXPERT SYSTEMS.

ANTROPIX CORP
351 TEALWOOD DR
HOUSTON, TX 77024
CONTRACT NUMBER: F29601-87-C-0040
DR MICHAEL BERRY
TITLE:
TIME RESOLVED TARGET AND PLUME OPTICAL PROPERTIES MEAS
DURING RP LASER INTERACTIONS
TOPIC# 197 OFFICE: AFWL/PRC

ANTROPIX CORPORATION PROPOSES TO OBTAIN TIME RESOLVED TARGET AND PLUME OPTICAL PROPERTIES MEASUREMENTS DURING RP LASER INTERACTIONS. TARGET ABSORBANCES (BOTH SURFACE AND IN-DEPTH) AND REFLECTANCES WILL BE DETERMINED WITH INTEGRATING SPHERE DEVICES PLUS PROBE BEAMS AND FAST DETECTORS. PLUME OPTICAL PROPERTIES DUE TO ATOMIC, MOLECULAR, PARTICULATE, AND PLASMA SPECIES WILL BE DETERMINED USING LASER PROBE ATTENUATION BEAMS AND FAST MULTICHANNEL DETECTORS. OPTICAL PROPERTIES OF BOTH BASELINE AND HARDENED MATERIALS WILL BE EXAMINED DURING IRRADIATIONS WITH RP HF/DF CHEMICAL LASER SYSTEMS (AT 2.7 AND 3.8 MICRONS, RESPECTIVELY) AND RP EXCIMER LASER SYSTEMS (AT 249 NM,

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351 NM, ETC.). TARGET OPTICAL MEASUREMENTS WILL BE ANALYZED TO OBTAIN ABSORPTION AND SCATTERING COEFFICIENTS FOR TRANSMISSION OF LASER RADIATION THROUGH MATERIALS AND TO OBTAIN SPECULAR AND DIFFUSE REFLECTION COEFFICIENTS FOR DECOUPLING OF LASER RADIATION FROM THE TARGET SURFACE. SIMULTANEOUS PLUME ATTENUATION MEASUREMENTS WILL BE USED TO ESTABLISH THE ABUNDANCES, ENERGY CONTENTS, AND OPTICAL PROPERTIES OF VAPOR, PLASMA, AND DEBRIS SPECIES WITH TEMPORAL, SPATIAL, AND SPECTRAL RESOLUTION. THE EFFECTS OF LASER AND INTERACTION PARAMETERS UPON TARGET RESPONSES AND PLUME STRUCTURE AND PROPERTIES (INCLUDING BEAM/PLUME COUPLING AND/OR BLOCKAGE) WILL BE DETERMINED. ALL OF THIS INFORMATION WILL BE RELATED TO MECHANISTIC MODELS OF LASER/MATERIALS INTERACTIONS, WITH PARTICULAR EMPHASIS ON LETHALITY AND TARGET HARDENING ISSUES.

AOG SYSTEMS CORP
PO BOX M
HARVARD, MA 01451
CONTRACT NUMBER:
DR HENRY C LEFKOVITS
TITLE:
IMPLEMENTATION STUDY FOR A LOCAL AREA NETWORK SCHEMA S
TOPIC# 62 OFFICE: RADC/XPX

THE PROCESSING OF USER QUERIES IN LOCAL AREA NETWORKS (LANs) WHERE MULTIPLE DATABASE MANAGEMENT SYSTEMS (DBMs) ARE BEING USED IS ADDRESSED IN THIS PROPOSAL. THE NEED EXISTS FOR A LAN FACILITY WHICH ACCEPTS QUERY INPUT FROM ANY NODE IN THE NETWORK AND PERFORMS ACCESSES AGAINST EACH APPLICABLE DBMS IN THE NETWORK TO RETRIEVE THE DESIRED DATA. IN ADDITION TO THE DEFINITION OF A COMMON NETWORK QUERY LANGUAGE, SUCH AS FACILITY REQUIRES FEATURES TO SUPPORT THE DECOMPOSITION OF NETWORK QUERIES INTO "SUBQUERIES", THE DISTRIBUTION OF SUBQUERIES TO EACH OF THE RESIDENT DBMSs WHICH CONTAIN APPLICABLE DATA, THE COLLECTION OF SUBQUERY RESPONSES, AND AGGREGATION OF SUBQUERY RESPONSES INTO A COMPOSITE QUERY RESPONSE. TO SUPPORT THESE REQUIREMENTS, A "SCHEMA SERVER" MUST BE MAINTAINED ON THE LAN WHICH PROVIDES A REPRESENTATION OF THE NETWORK SCHEMS, WHICH IS A AGGREGATE OF ALL LAN-RESIDENT DATABASE SCHEMAS. PROPOSED HEREIN IS AN IMPLEMENTATION STUDY FOR A LAN SCHEMA SERVER (LANSS) HARDWARE/SOFTWARE CAPABILITY WHICH IS BASED ON PAST RESEARCH BY AOG SYSTEMS CORPORATION

SUBMITTED BY

INTO AN INTEGRATED DATA NETWORK (IDN) FOR ROME AIR DEVELOPMENT CENTER, AND THE DRAFT PROPOSED AMERICAN NATIONAL STANDARD (dpANS) INFORMATION RESOURCE DICTIONARY SYSTEM (IRDS).

APA OPTICS INC
2950 NE - 84TH LN
BLAINE, MN 55432
CONTRACT NUMBER: F33615-87-C-1430
ANIL K JAIN
TITLE:
INTEGRATED OPTICS SCANNER FOR WAFER INTERCONNECT
TOPIC# 154 OFFICE: AFWAL/AA

CONVENTIONAL INTERCONNECT AND SWITCHING TECHNOLOGY HAS BEEN IDENTIFIED AS A LIMITATION IN HIGH THRUPUT PROCESSORS AND COMPUTERS. WAFER SCALE INTEGRATION IS ONE TECHNIQUE TO RESOLVE INTERCONNECT PROBLEMS. METHODS OF INTERFACING TO WAFER SCALE DEVICES WILL RESOLVE INTERCONNECT PROBLEMS. METHODS OF INTERFACING TO WAFER SCALE DEVICES WILL REQUIRE OPTICAL INTERCONNECT TECHNIQUES. IMPLEMENTING COMMUNICATION IN AVIONICS SYSTEMS EMPLOYING FULL WAFER UNION BY MENAS OF A FREE SPACE OPTICAL LASER BEAM COMMUNICATION LINK IS PROPOSED. THE IMPLEMENTATION IS BASED UPON A LASER SCANNING CONCEPT DEVELOPED BY APA OPTICS. THE LASER SCANNING CONCEPT WAS SHOWN FEASIBLE IN A NASA PHASE I SBIR PROGRAM. THE CONCEPT IS UNIQUE IN PERMITTING LASER SCANS OF LARGE ANGULAR DEFLECTION WITHOUT THE USE OF MOVING PARTS. WHEN INTEGRATED INTO FULL WAFER SCALE PACKAGING OF AVIONICS IT CAN PROVIDE THE COMMUNICATION CAPABILITY NEEDED IN HIGH THROUGHOUT SYSTEMS. THE KEY ELEMENT IN THE PROPOSED WORK IS THE DEVELOPMENT AND DEMONSTRATION OF A MEANS OF EFFICIENCY CONTROLLING A TWO-DIMENSIONAL LASER COMMUNICATION BEAM SCAN.

APPLICATIONS RESEARCH CORP
4031 COLONEL GLENN HWY
DAYTON, OH 45431
CONTRACT NUMBER: F33615-87-C-0191
THOMAS V BROWN
TITLE:
ELECTRONIC WARFARE EFFECTIVENESS DISPLAY METHODOLOGY
TOPIC# 165 OFFICE: ASD/XR

SUBMITTED BY

THE PROPOSED METHODOLOGY WOULD ALLOW ELECTRONIC WARFARE SIMULATION MODELS TO BE APPLIED MORE DIRECTLY TO EFFECTIVENESS STUDIES. DISPLAY DATA AND FORMATS COULD BE SELECTED TO MATCH THE PROBLEM UNDER INVESTIGATION AT THE USER'S DISCRETION. DISPLAY FORMS, GOVERNING HOW THE DATA IS PRESENTED, WOULD BE KEPT WITHIN A CUMULATIVE LIBRARY SO THAT NEW SIMULATION OUTPUTS COULD BE PLOTTED IN THE SAME FORMAT. IN THIS WAY, EACH INDIVIDUAL CAN USE THE DISPLAY FORM WHICH BEST SUITS HIS PREFERENCE AND PURPOSE. THE RANGE OF DISPLAY POSSIBILITIES FOR THE USER WOULD ALLOW HIM TO PROGRESSIVELY IMPROVE HIS SELECTION.

APPLIED ORDNANCE TECHNOLOGY INC
9015 WOODYARD RD - STE 108
CLINTON, MD 20735
CONTRACT NUMBER:
LUTHER M GRAINGER
TITLE:
ROBOTICS FOR SOLID PROPELLANT MIXING LABORATORIES
TOPIC# 189 OFFICE: AFRPL/TSTR

THE PROGRAM WILL INVESTIGATE THE STATE-OF-THE-ART IN PROPELLANT MIXING, WITH AN EMPHASIS ON THOSE PROCESSING TECHNIQUES WHICH REDUCE PERSONNEL EXPOSURE, IMPROVE QUALITY AND REDUCE LABOR COSTS ASSOCIATED WITH THE PROCESSING OPERATIONS. INVESTIGATED APPROACHES WILL INCLUDE THE USE OF ROBOTICS AND ADVANCED PROCESS CONTROL/MONITORING INSTRUMENTATION SYSTEMS TO FACILITATE INGREDIENT WEIGHING AND PREBATCHING, INGREDIENT ADDITION, ON-LINE MONITORING OF RELEVANT MIX PARAMETERS, PROPELLANT CASTING AND CLEAN-UP. EXTENSIVE RESEARCH WILL BE CONDUCTED ON TECHNIQUES USED BY THE CHEMICAL, RUBBER, PLASTICS, DRUG AND FOOD MANUFACTURING INDUSTRIES, BOTH DOMESTIC AND FOREIGN.

APPLIED RESEARCH ASSOCS INC
6404 FALLS OF NEUSE RD - STE 200
RALEIGH, NC 27615
CONTRACT NUMBER:
LAWRENCE A TWISDALE JR
TITLE:
STOCHASTIC METHODS IN PROTECTIVE STRUCTURES
TOPIC# 69 OFFICE: AFESC/RDXP

SUBMITTED BY

A PHASE I EFFORT IS PROPOSED TO INTEGRATE PREVIOUS WORK AND DEVELOP THE NEEDED RESEARCH BASE TO ASSESS AND DEVELOP STOCHASTIC METHODS FOR PROTECTIVE DESIGN FOR NON-NUCLEAR WEAPONS. THE CORNERSTONE OF THIS EFFORT WILL BE THE DEVELOPMENT OF A RELIABILITY-BASED DESIGN (RBD) PROCEDURE. THERE ARE SEVERAL WELL DEVELOPED RBD PROCEDURES (LOAD AND RESISTANCE FACTORS, FIRST-ORDER SECOND-MOMENT, AND MONTE CARLO METHODS) THAT ARE RELEVANT TO STOCHASTIC PROTECTIVE DESIGN. AN INFORMED SELECTION OF ONE OF THESE METHODS REQUIRES, FIRST, AN ANALYSIS OF THE UNCERTAINTIES; AND SECOND, AN ASSESSMENT OF COMPUTATIONALS SIMPLICITY/PREDICTION ACCURACY TRADEOFFS. HENCE, THE PROPOSED PHASE I TECHNICAL OBJECTIVES ARE: (1) IDENTIFY AND ANALYZE UNCERTAINTIES FOR EACH BASIC STRUCTURAL RESPONSE FAILURE MODE FOR PROTECTIVE STRUCTURES; (2) REVIEW STOCHASTIC METHODS AND PERFORM CALCULATIONS OF PROBABILITY OF SURVIVAL USING EACH OF THE ALTERNATIVE RBD PROCEDURES FOR THE RELEVANT FAILURE MODES FOR TWO PROTECTIVE STRUCTURE DESIGNS; AND (3) DEVELOP AND PRESENT A DETAILED PLAN OF THE TASKS REQUIRED TO DEVELOP STATE-OF-THE-ART RBD PROCEDURES FOR EACH LOAD-RESPONSE MECHANISM.

APPLIED RESEARCH ASSOCS INC
4300 SAN MATEO BLVD NE - STE A-220
ALBUQUERQUE, NM 87110
CONTRACT NUMBER:
DR DOUGLAS H MERKLE
TITLE:
GRAVITY EFFECTS ON SMALL-SCALE STRUCTURAL MODELING
TOPIC# 72 OFFICE: AFESC/RDXP

THE PROPOSED EFFORT IS TO DEVELOP MATERIALS AND PROCEDURES TO APPLY REECH-FROUDE SCALING TO SUB-SCALE MODEL TESTS OF REINFORCED CONCRETE STRUCTURES SUBJECTED TO CONVENTIONAL (NON-NUCLEAR) WEAPON EFFECTS.

APPLIED RESEARCH ASSOCS INC
4300 SAN MATEO BLVD NE - STE A220
ALBUQUERQUE, NM 87110
CONTRACT NUMBER:
PETER T DZWILEWSKI
TITLE:
MOBILE MISSILE TEL ANALYSIS
TOPIC# 203 OFFICE: BMO/MYSC

SUBMITTED BY

A METHOD TO PREDICT THE PERFORMANCE OF HEAVY WHEELED OR TRACKED GROUND VEHICLES IS PROPOSED. THE STEPS FOR DEVELOPING THESE PREDICTION TECHNIQUES ARE 1) ESTIMATES OF LOADS AND TRACK OR TIRE CONFIGURATION, 2) DEFINITION OF THE SOIL PROPERTIES IN PARTICULAR THE SHEAR STRENGTH, 3) NUMERICAL SIMULATION OF THE VEHICLE-SOIL INTERACTION USING A FINITE DIFFERENCE COMPUTER CODE FROM WHICH THE SOIL DEFORMATION AND HENCE MOBILITY RESISTANCE IS OBTAINED, 4) DEVELOPMENT OF A SET OF SIMPLIFIED PREDICTIVE EQUATIONS FOR MOBILITY RESISTANCE, 5) VERIFICATION OF METHOD BY COMPARING RESULTS WITH EXISTING EXPERIMENTS, AND 6) IMPLEMENTATION OF PREDICTIVE EQUATIONS IN A PROBABILISTIC ASSESSMENT CODE FROM WHICH THE MOST LIKELY RESULTS, PROBABILITY OF OCCURRENCE, UNCERTAINTIES, AND SENSITIVITIES CAN BE OBTAINED.

APPLIED SCIENCE GP INC
335 BEAR HILL RD
WALTHAM, MA 02154
CONTRACT NUMBER:
JOSHUA BORAH
TITLE:
HELMET MOUNTED EYE POSITION/ORIENTATION SENSING FOR AI COCKPITS
TOPIC# 73 OFFICE: AMD/RDO

TO FUNCTION AS ENVISIONED, THE AIR FORCE VIRTUAL COCKPIT CONCEPT MUST INCLUDE EYE MOVEMENT MEASUREMENT. AN EYE TRACKING SYSTEM MUST BE DEVELOPED TO PROPERLY INTERFACE WITH THE VIRTUAL COCKPIT AND TO PROVIDE THE NEEDED PERFORMANCE. ASL PROPOSES TO 1) DEFINE THE REQUIREMENTS FOR SUCH AND EYE TRACKER, 2) ANALYZE THE TECHNICAL APPROACHES THAT CAN MEET THESE REQUIREMENTS, 3) PERFORM PRELIMINARY DESIGN OF AN APPROPRIATE SYSTEM, 4) OUTLINE A PHASE II PROGRAM FOR PRODUCING A PROTOTYPE. ALTHOUGH WE PROPOSE TO SERIOUSLY INVESTIGATE THE ENTIRE SPECTRUM OF CURRENT AND POTENTIAL EYE TRACKING TECHNIQUES, OUR CONSIDERABLE EXPERIENCE IN THIS FIELD LEADS US TO BELIEVE THAT THE BEST APPROACH WILL TURN OUT TO BE AN ADVANCE ON TV OR ARRAY SENSOR TYPE SYSTEMS EMPLOYING THE PUPIL CENTER TO CORNEAL REFLEX TECHNIQUE.

APTEK INC
2862 S CIRCLE DR - STE 346
COLORADO SPRINGS, CO 80906
CONTRACT NUMBER: F29601-87-C-0020
BRETT A LEWIS
TITLE:
A KNOWLEDGE SUPPORT SYSTEM FOR SATELLITE SURVIVABILITY
TOPIC# 194 OFFICE: AFWL/PRC

SUBMITTED BY

CURRENTLY SURVIVABILITY ASSESSMENTS DO NOT USE ARTIFICIAL INTELLIGENCE TECHNIQUES. THE GOAL OF THIS PHASE I PROPOSAL IS TO BUILD A DEMONSTRATABLE KNOWLEDGE SUPPORT SYSTEM TO ASSIST SURVIVABILITY ANALYSTS AND SYSTEM ARCHITECTS IN MAKING SURVIVABILITY ASSESSMENTS. SPECIFICALLY, WE WILL BUILD A SYSTEM INCORPORATING A SATELLITE/WEAPON DESCRIPTION AND PROBABILISTIC METHODS THAT WILL PROVE THE FEASIBILITY OF USING ARTIFICIAL INTELLIGENCE TECHNIQUES. WE WILL USE THE FRAMES REPRESENTATION TO DESCRIBE THE SATELLITE/WEAPON DATABASE. A CONTROL STRUCTURE WILL BE WRITTEN TO ASSIST THE SURVIVABILITY ANALYST OR SYSTEM ARCHITECT IN MAKING SURVIVABILITY ASSESSMENTS. A SIMPLE ENGLISH INTERFACE WILL BE ATTACHED TO THE CONTROL STRUCTURE SO THAT PERSONS NOT FAMILIAR WITH SURVIVABILITY METHODS MAY MAKE ASSESSMENTS. THE RESULTS WILL BE PRESENTED IN GRAPHICAL FORM SO THAT INTERPRETATION OF RESULTS WILL BE EASY AND QUICK. IT IS PLANNED THAT THIS PROGRAM WILL BE DEMONSTRATED TO AN AFWL REPRESENTATIVE AT THE END OF THE PHASE IS STUDY.

APTEK INC
2862 S CIRCLE DR - STE 346
COLORADO SPRINGS, CO 80906
CONTRACT NUMBER:
BARBARA B LEWIS
TITLE:
STRESS ANALYSIS OF HYPERVELOCITY MODELS UNDER HIGH G-L
TOPIC# 207 OFFICE: BMO/MYSC

THE OBJECTIVE OF THE PROPOSED WORK IS TO ANALYZE THE HYPERVELOCITY MODELS TESTED AT ARNOLD ENGINEERING DEVELOPMENT CENTER TO DETERMINE THE CAUSE OF NOSETIP FRACTURES. WE WILL ACCOMPLISH THIS GOAL BY PERFORMING TWO- AND THREE-DIMENSIONAL FINITE ELEMENT ANALYSES OF THE HYPERVELOCITY MODEL USING DYNA2D AND DYNA3D. IF NECESSARY, WE WILL ALSO DO HYDRODYNAMIC ANALYSES OF THE GAS EXPANSION WHICH DRIVES THE PROJECTILE (HYPERVELOCITY MODEL). AS A RESULT OF THE ANALYSES, WE WILL RECOMMEND CHANGES THAT CAN BE MADE TO REDUCE THE PROBABILITY OF FAILURE OF THE MODELS.

ARITHMETIKA INC
423 W 120TH ST - #88
NEW YORK, NY 10027
CONTRACT NUMBER: FQ8671-8701485
DR GREGORY V CHUDNOVSKY
TITLE:
DESIGN AND IMPLEMENTATION OF HIGH-PRECISION AND HIGH P
PARALLEL SOFTWARE AND HARDWARE
TOPIC# 241 OFFICE: AFOSR/XOT

SUBMITTED BY

WE PROPOSE A STUDY OF AN OPTIMAL DESIGN FOR A POWERFUL SINGLE PROCESSOR AND A PARALLEL ORGANIZATION OF SUCH PROCESSORS FOR THE PURPOSE OF SIGNIFICANT IMPROVEMENT OF SUPERCOMPUTER PERFORMANCE. WE PLAN TO DETERMINE THE OPTIMAL DESIGN OF THE LST SINGLE PROCESSOR WITH THE LARGEST POSSIBLE WORD SIZE FROM THE POINT OF VIEW OF CURRENTLY COMMERCIALLY AVAILABLE VLSI TECHNOLOGY. SIMULTANEOUSLY, WE WILL INVESTIGATE THE BEST PARALLEL ORGANIZATION OF POWERFUL PROCESSORS TO ACHIEVE THE BEST PERFORMANCE OF THE PARALLEL IMPLEMENTATION OF PRACTICALLY IMPORTANT MATHEMATICAL AND ENGINEERING ALGORITHMS. NEW PARALLEL ALGORITHMS WILL BE INVESTIGATED IN SUCH AREAS AS: SIGNAL PROCESSING (CONVOLUTIONS OF LARGE DATA ARRAYS AND CODING THEORY), GRAPHIC PROCESSING AND NUMERICAL ANALYSIS (SOLUTION OF ALGEBRAIC AND DIFFERENTIAL EQUATIONS). PARTICULAR ATTENTION WILL BE DEVOTED TO THE FEASIBILITY STUDY OF AN EFFICIENT PARALLEL/VECTOR COMPILER FOR FORTRAN AND APL. OPTIMIZATION OF COMMUNICATION, MEMORY ACCESS AND PROCESSOR CLUSTERING WILL BE ADDRESSED. THE ORGANIZATION OF PROCESSORS AND THE PERFORMANCE OF EACH PROCESSOR WILL BE ANALYZED PRIMARILY FROM THE POINT OF VIEW OF HIGH PRECISION OPERATIONS AND OPERATIONS ON LONG DATA ARRAYS NECESSARY IN SIGNAL AND GRAPHIC PROCESSING, NUMBER THEORY AND LARGE SCALE NUMERICAL AND ENGINEERING PROBLEMS.

ARNCO
4071 S ACCESS RD
CHATTANOOGA, TN 37406
CONTRACT NUMBER: 33615-87-C-3407
RICHARD W YOUNG
TITLE:
SELF SEALING/LOW VULNERABILITY AIRCRAFT TIRE
TOPIC# 114 OFFICE: AFWAL/FI

THE DESIRABILITY AND PRACTICALITY OF A SELF-SEALING TIRE HAS BEEN ESTABLISHED FOR A NUMBER OF YEARS. AT PRESENT, THERE ARE SEVERAL APPROACHES TO THIS PROBLEM AVAILABLE IN THE MARKETPLACE. HOWEVER, THE AVAILABLE SYSTEMS CAN ONLY PROVIDE PUNCTURE PROTECTION IN THE TREND AREA OF THE TIRE. THIS IS NOT ADEQUATE FOR MILITARY PURPOSES WHERE PROTECTION MUST BE PROVIDED OVER THE ENTIRE SURFACE OF THE TIRE CASING. IN ADDITION, THE CURRENT SYSTEMS ARE VERY EXPENSIVE. ARNCO HAS DEVELOPED, AND SUCCESSFULLY TESTED, A SELF-SEALING POLYURETHANE

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TIRE LINING SYSTEM FOR COMMERCIAL OVER-THE-ROAD VEHICLES THAT IS PROOF AGAINST PUNCTURES UP TO 7.5MM IN DIAMETER. THE SYSTEM IS INEXPENSIVE IN USE AND THE EQUIPMENT SIMPLE TO OPERATE. THE OBJECTIVE OF THIS PROGRAM IS TO EXPAND THIS SYSTEM TO ALLOW THE ENTIRE INNER SURFACE OF A TUBELESS AIRCRAFT TIRE CASING TO BE PROTECTED WITH A POLYURETHANE SELF-SEALING LINING MATERIAL. IN ADDITION WE EXPECT TO DEMONSTRATE A CONSIDERABLE COST SAVING IN RELATION TO PRODUCTS CURRENTLY AVAILABLE OR PROPOSED TO THE MILITARY.

ASTRO INNOVATIONS INC
290 PHEASANT RUN
FEASTERVILLE, PA 19047
CONTRACT NUMBER:
JOSEPH BEDNARZ
TITLE:
ALTERNATIVE FLIGHT TEST LAUNCHER EVALUATION
TOPIC# 206 OFFICE: BMO/MYSC

THE PROPOSED STUDY WILL CRITICALLY EVALUATE SIX OR MORE INNOVATIVE CONCEPTS FOR LAUNCHING FLIGHT TEST PAYLOADS TO KWAJELEIN ATOLL, WITH EMPHASIS ON COST EFFECTIVENESS, PARTICULARLY FOR SMALL PAYLOADS (UNDER 50 LBS). CANDIDATE CONCEPTS WILL BE COMPARED FOR PERFORMANCE OVER THE FULL SPECTRUM OF ANTICIPATED PAYLOAD WEIGHTS AND FULL FLIGHT TEST ENVIRONMENT ENVELOPE. EVALUATION OF PAYLOAD LAUNCH ENVIRONMENT, AND PROJECTED TOTAL COST WILL BE STRONG DISCRIMINATORS IN SELECTING PREFERRED OPTIONS AS WILL THE READINESS OF THE REQUIRED TECHNOLOGY INVOLVED. A HARDWARE DEVELOPMENT AND TEST PROGRAM WILL BE DEVELOPED FOR SELECTED CONCEPTS, WITH EMPHASIS DIRECTED TOWARDS THE SMALL PAY-LOAD SOLUTION.

ASTRON RESEARCH & ENGINEERING
2028 OLD MIDDLEFIELD WY
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER: F33615-87-C-3238
LLOYD R NORRIS
TITLE:
FINITE-ELEMENT MODELS FOR THE SUPPORTABILITY OF UNITED AIR FORCE (USAF) AIRCRAFT STRUCTURES
TOPIC# 111 OFFICE: AFWAL/FI

SUBMITTED BY

ASTRON RESEARCH AND ENGINEERING PROPOSES TO ASSESS THE FEASIBILITY OF IMPLEMENTING A USAF-WIDE DATABASE OF FINITE ELEMENT MODELS FOR THE SUPPORTABILITY OF STRUCTURES OF USAF AIRCRAFT. THIS STUDY WILL INCLUDE (1) AN EXAMINATION OF VARIOUS AIR FORCE ORGANIZATIONS AND THEIR CURRENT METHODS AND REQUIREMENTS FOR FINITE ELEMENT MODEL DEVELOPMENT, ANALYSIS, AND DATA TRANSFER, (2) A SURVEY OF THE AVAILABLE SOFTWARE WHICH MAY BE USED FOR THE DEVELOPMENT OF A CENTRALIZED FINITE ELEMENT DATABASE, (3) A SPECIFICATION OF THE NECESSARY SOFTWARE AND SOFTWARE INTERFACES REQUIRED FOR CREATING THIS DATABASE, (4) A PLAN FOR IMPLEMENTING THE DATABASE, AND (5) AN ASESSMENT OF THE RELATIVE COSTS FOR DEVELOPING AND IMPLEMENTING THE DATABASE USAF-WIDE. BOTH TANGIBLE AND INTANGIBLE BENEFITS WILL BE CONSIDERED IN THE ASSESSMENT OF THE FEASIBILITY OF THE CENTRALIZED DATABASE.

ATAC
1200 VILLA ST
MOUNTAIN VIEW, CA 94041
CONTRACT NUMBER: F33615-87-C-5319
BRADLEY C ASHMORE
TITLE:
AN AUTOMATED ANALYTIC METHOD FOR IMPROVING INTEGRATED TESTABILITY
TOPIC# 90 OFFICE: AMD/RDO

THE OBJECTIVE OF PHASE I OF THIS PROJECT IS TO 1) SPECIFY COMPUTATIONALLY EFFICIENT ANALYTIC ALGORITHMS THAT WILL DETECT WIDE CLASSES OF LOGICAL STRUCTURES IN INTEGRATED CIRCUITS (ICs) THAT INHIBIT CIRCUIT TESTABILITY, AND TO 2) SPECIFY A STRATEGY FOR DETERMINING WHICH OF THESE LOGICAL STRUCTURES TO SEARCH FOR IN ICs. IN PHASE II, THE SPECIFIED ALGORITHMS WILL BE CODED AND THE SEARCH STRATEGY IMPLEMENTED. THIS WILL YIELD A CODE THAT WILL EFFICIENTLY DETECT TESTABILITY-INHIBITING LOGICAL STRUCTURES IN ORDER TO ASSESS THE FAULT COVERAGE OF ICs. THIS APPROACH COULD GREATLY REDUCE DEPENDENCE ON THE CURRENT APPROACH TO DETERMINING FAULT COVERAGE IN ICs THAT IS BASED ON TIME CONSUMING AND CPU-INTENSIVE SIMULATIONS.

ATEAM CORP
7920 CHAMBERSBURG RD
DAYTON, OH 45424
CONTRACT NUMBER: F33615-87-C-1479
KENNETH D WILKINSON
TITLE:
EXPERT TAILORING ASSISTANT FOR MIL-STD-2165
TOPIC# 143 OFFICE: AFWAL/AA

SUBMITTED BY

THE RESULTS OF PROPER TESTABILITY DESIGN IMPLEMENTATION ASSURE THAT A SYSTEM CAN BE THOROUGHLY TESTED WITH MINIMUM EFFORT AND COST, AND THAT HIGH CONFIDENCE CAN BE ASCRIBED TO THE TEST RESULTS. THE SUCCESS OR FAILURE OF DESIGN FOR TESTABILITY IS LARGELY DEPENDENT ON HOW WELL THE AIR FORCE SPECIFIES THE DESIGN FOR TESTABILITY DEVELOPMENT PROCESS IN THE REQUEST FOR PROPOSAL. MIL-STD-2165, TESTABILITY PROGRAM FOR ELECTRONIC SYSTEMS AND EQUIPMENT, DEFINES A STRUCTURED DEVELOPMENT AND DESIGN PROCESS THROUGH WHICH TESTABILITY DESIGN CHARACTERISTICS CAN BE ACHIEVED AT AFFORDABLE COSTS AND AT A LEVEL CONSISTENT WITH THE OVERALL MISSION AND SUPPORT REQUIREMENTS OF THE SYSTEM BEING DEVELOPED. EVEN WITH THIS GUIDANCE, DEFICIENCIES IN RFP DESIGN FOR TESTABILITY SPECIFICATION EXIST. TO OVERCOME THESE DEFICIENCIES AND PROVIDE A USER FRIENDLY AUTOMATED SYSTEM FOR DEVELOPING SOW DESIGN FOR TESTABILITY SPECIFICATIONS, DIDS AND EVALUATION CRITERIA, ATEAM PROPOSES THE DEVELOPMENT OF AN AUTOMATED DESIGN FOR TESTABILITY RFP TAILORING ASSISTANT BASED ON EXPERT SYSTEM TECHNOLOGY. THE EXPERT TAILORING ASSISTANT WILL ASSIST PROGRAM MANAGERS IN TAILORING DESIGN FOR TESTABILITY SPECIFICATIONS TO THE PECULIARITIES OF THEIR SPECIFIC PROJECTS. OUTPUTS INCLUDE TAILORED SOW SPECIFICATIONS, TAILORED DIDS AND TAILORED EVALUATION CRITERIA.

ATHENA SYSTEMS INC
4546 EL CAMINO REAL - STE K
LOS ALTOS, CA 94022
CONTRACT NUMBER:
DR TEDLIU
TITLE:
HIGH PRODUCTIVITY SOFTWARE ENGINEERING WORKSTATION
TOPIC# 51 OFFICE: RADC/XPX

SOFTWARE DEVELOPOMENT FACES A CRITICAL PRODUCTIVITY PROBLEM. BECAUSE THE PROCESS RELIES ON MOSTLY MANUAL METHODS. SOFTWARE PRODUCT QUALITY HAS DECLINED AS COMPLEXITY AND RELIABILITY EXPECTATIONS HAVE INCREASED. THE INFORMATION MANAGEMENT DEMANDS OVERTAX EXISTING PROJECT MANAGEMENT AND DOCUMENT PREPARATION PROCEDURES. THIS HAS CREATED AN EVER-INCREASING MOUNTAIN OF DEVELOPMENT AND MAINTENANCE BACKLOGS. THE MOST PRESSING NEED IS AUTOMATED SUPPORT FOR "MANAGEMMENT OF COMPLEXITY." IDI'S PREVIOUS WORK WITH COMMERCIAL AND GOVERNMENT CLIENTS HAS HELPED US IDENTIFY THE REQUIREMENTS FOR A WORKSTA-

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TION-BASED SOFTWARE DEVELOPMENT ENVIRONMENT. THE KEY TO REALIZING THE BENEFITS OF THIS AUTOMATION IS TO INTEGRATE THESE TOOLS BY SHARING INFORMATION AND PRESENTING A CONSISTENT AND POWERFUL USER INTERACTION METHOD. THE GOALS OF A SOFTWARE ENGINEERING ENVIRONMENT ARE TO PROVIDE SIGNIFICANTLY IMPROVED PRODUCTIVITY AND PRODUCT QUALITY. THE ENVIRONMENT MUST AUTOMATE MORE LIFE CYCLE TASKS, AND CONTROL THE DEVELOPING PRODUCT WITH BETTER INFORMATION MANAGEMENT. IT MUST ADDRESS THE ENTIRE LIFE CYCLE, WITH CHANGES TO THE RELATIVE DISTRIBUTION OF EFFORT (INCREASE ANALYSIS, DECREASE MAINTENANCE). THE ENVIRONMENT SHOULD SUPPORT THE USE OF MODERN METHODS AND TECHNIQUES SUCH AS REQUIREMENTS AND DESIGN MODELING/SIMULATION (INCLUDING PROTOTYPING), AND PROVIDE SUPPORT FOR EXISTING STANDARDS: ADA (PROGRAMMING), 2167 (DOCUMENTATION). FINALLY, THE WORKSTATION WHICH HOSTS THE ENVIRONMENT MUST PROVIDE AN "OPEN, FLEXIBLE, EXTENSIBLE" ARCHITECTURE. THIS ARCHITECTURE WILL UNIFY AND INTEGRATE EXISTING (STAND-ALONE) TOOLS, COPE WITH THE EXISTING DIVERSITY OF HARDWARE, AND EVENTUALLY INCORPORATE ALL KNOWLEDGE BASES AND EXPERT SYSTEM TECHNIQUES AS THEY MATURE.

ATSS INC
606 E MILL ST - STE 1022
SAN BERNARDINO, CA 92408
CONTRACT NUMBER:
HENRY L MOODY
TITLE:
HEATSHIELD/STRUCTURE ATTACHMENT
TOPIC# 234 OFFICE: BMO/MYSC

DESIGN METHODS AND MATERIAL COMBINATIONS SHALL BE IDENTIFIED TO ENHANCE THE STRUCTURAL INTEGRITY OF ADVANCED STRATEGIC SYSTEMS USING LARGE ANTENNA WINDOWS. THE INTEGRATION OF ANTENNA WINDOWS AND HEATSHIELDS IN MANEUVERING VEHICLES SHALL BE SPECIFICALLY ADDRESSED IN THE PROPOSED PROGRAM.

ATSS INC
606 E MILL ST - STE 1022
SAN BERNARDINO, CA 92408
CONTRACT NUMBER:
HENRY L MOODY
TITLE:
BRILLIANT GUIDANCE FOR ICBMs
TOPIC# 237 OFFICE: BMO/MYSC

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BRILLIANT GUIDANCE SYSTEMS FOR ICBMs WILL RELY ON ADVANCED THERMAL PROTECTION AND PROCESSING TECHNOLOGIES TO PRESERVE SENSOR PERFORMANCE IN SEVERE REENTRY ENVIRONMENTS. IN THIS STUDY REENTRY EFFECTS ON SENSORS WILL BE ASSESSED, AND PASSIVE AND ACTIVE THERMAL PROTECTION SYSTEMS WILL BE EVALUATED. MEANS OF USING ADVANCED SIGNAL PROCESSING METHODS TO REDUCE REENTRY-INDUCED ERRORS WILL BE EXPLORED. THE STUDY WILL PROVIDE SPECIFIC RECOMMENDATIONS FOR MODIFICATIONS TO CURRENT AND PROPOSED REENTRY SYSTEMS.

ATSS INC
606 E MILL ST - STE 1022
SAN BERNARDINO, CA 92408
CONTRACT NUMBER:
HENRY L MOODY
TITLE:
ANTENNA WINDOW ABLATION
TOPIC# 240 OFFICE: BMO/MYSC

TRANSIENT THREE-DIMENSIONAL ANALYSIS METHODS SHALL BE ADDED TO THE COUPLE CODE (A CURRENT AIR FORCE ANTENNA WINDOW ABLATION ANALYSIS METHOD) TO PREDICT ANTENNA WINDOW/HEATSHIELD SHAPE CHANGE FOR MANEUVERING REENTRY VEHICLES. THE ANALYSIS METHOD SHALL CONSIDER BOTH MONOLITHIC AND BUTTON ARRAY ANTENNA WINDOW DESIGNS. ANGLE-OF-ATTACK EFFECTS INDUCED BY MANEUVERING FUNCTIONS SHALL BE INCLUDED IN THE FLOWFIELD.

AUGUST SYSTEMS INC
18277 SW BOONES FERRY RD
TIGARD, OR 97224
CONTRACT NUMBER:
JOHN H WENSLEY
TITLE:
SAFETY/COMPUTER FOR NUCLEAR WEAPONS/POWER AND SAFETY C
COMPUTER CONTROLLED SYSTEMS
TOPIC# 205 OFFICE: BMO/MYSC

HIGHLY RELIABLE COMPUTERS ARE NEEDED TO SUPPORT EXECUTION OF SAFETY CRITICAL SOFTWARE. MODERN VLSI TECHNOLOGY, COUPLED WITH ADVANCED

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FAULT TOLERANCE TECHNIQUES, OFFERS THE POTENTIAL OF A COMPUTER WITH A PREDICTED RELIABILITY OF .9999 OVER A 5 YEAR OPERATING CYCLE WITHOUT REPAIR. USING VOTING TECHNIQUES TO DETECT AND MASK THE EFFECTS OF BOTH...AND TRANSIENT FAILURES, IT APPEARS PRACTICAL TO REDUCE THE PROBABILITY OF AN UNPROTECTED SINGLE BIT ERROR TO LESS THAN 1x10-9 OVER A 5 BIT YEAR CYCLE. THE PROPOSED EFFORT WILL RESEARCH THE FEASIBILITY OF DESIGNING SUCH A SYSTEM USING CURRENTLY AVAILABLE VLSI MODULES AND FIELD-PROVEN FAULT TOLERANCE APPROACHES. THIS RESEARCH EFFORT WILL INCLUDE: (1) EXPLORATION OF THE REQUIREMENTS OF SAFETY CRITICAL COMPUTER APPLICATIONS IN BOTH GOVERNMENT AND INDUSTRY; (2) ANALYSIS OF THE TRADE OFFS AND RELATIONSHIPS AMONG COMPONENT RELIABILITY, INTEGRATION, COST, AND FAULT TOLERANCE TECHNIQUES. A ARCHITECTURAL DEFINITION OF A FAULT TOLERANT COMPUTER USING CURRENTLY AVAILABLE COMPONENT AND FAULT TOLERANCE TECHNOLOGY; AND (4) EVALUATION OF THE DESIGN FOR FEASIBILITY IN TERMS OF RELIABILITY, PERFORMANCE, AND COST. AUGUST SYSTEMS BRINGS TO THIS EFFORT PRACTICAL EXPERIENCE WITH COMMERCIAL FAULT TOLERANCE COMPUTERS IN A WIDE RANGE OF SAFETY CRITICAL CONTROL APPLICATIONS.

AVTRON MANUFACTURING INC
10409 MEECH AVE
CLEVELAND, OH 44105
CONTRACT NUMBER:
MARK J STEINMETZ
TITLE:
PULSE TO DIGITAL CONVERSION SYSTEM
TOPIC# 26 OFFICE: AEDC/DOT

IT IS PROPOSED TO DETERMINE THE FEASIBILITY OF CONSTRUCTING A ONE STEP FREQUENCY MEASURING INSTRUMENT CAPABLE OF MEASURING AS MANY AS 32 FREQUENCIES SIMULTANEOUSLY. FREQUENCIES TO BE BETWEEN 2 AND 5000 Hz WITH EACH CHANNEL CAPABLE OF MEASURING OVER THE ENTIRE RANGE. EACH CHANNEL TO BE PROGRAMMABLE AS TO SAMPLE RATE. OUTPUT DATA TO BE AVAILABLE TO AND COMPATIBLE WITH THE IBM-PC BUS.

BARRON ASSOCS INC
RTE 1 - BOX 159
STANARDSVILLE, VA 22973
CONTRACT NUMBER: F33615-87-C-3610
GERARD J MONTGOMERY
TITLE:
ABDUCTIVE AND INDUCTIVE REASONING IN MAINTENANCE DIAGN
TOPIC# 123 OFFICE: AFWAL/FI

SUBMITTED BY

THE PROPOSED RESEARCH IS FOR DEVELOPMENT OF ABDUCTIVE AND INDUCTIVE REASONING ALGORITHMS THAT WILL AID IN THE DEVELOPMENT OF FLIGHT CONTROL SYSTEM (FCS) MAINTENANCE DIAGNOSTIC SYSTEMS AND THAT WILL OVERCOME MANY OF THE LIMITATIONS OF EXISTING DIAGNOSTIC TECHNOLOGY. A FOCUS OF THE EFFORT WILL BE THE DEVELOPMENT OF A CAPABILITY TO REASON ABOUT FSC FAULTS AT A SYSTEM LEVEL WITH UNCERTAIN INFORMATION. THE OBJECTIVES OF THE EFFORT ARE TO: DEVELOP THE TOP LEVEL DESIGN OF A COMPREHENSIVE ABDUCTIVE AND INDUCTIVE REASONING SYSTEM FOR FCS DIAGNOSTICS; DEVELOP THE DETAILED DESIGN FOR PORTIONS OF THE REQUIRED REASONING ALGORITHMS; IMPLEMENT A DEMONSTRATION OF THE PROPOSED ABDUCTIVE AND INDUCTIVE REASONING MECHANISMS TO DEMONSTRATE THE FEASIBILITY AND THE BENEFITS OF THE SELECTED APPROACH; INVESTIGATE AND DOCUMENT THE POTENTIAL BENEFITS, AND DEVELOP A ROADMAP FOR ATTAINING THE HIGH PAYOFF CAPABILITIES. THESE OBJECTIVES WILL BE MET BY PERFORMING THE INITIAL DESIGN AND IMPLEMENTATION OF A FCS DIAGNOSTIC ABDUCTIVE AND INDUCTIVE REASONING (DAIR) SYSTEM.

BATTERY ENGINEERING INC
1636 HYDE PARK AVE
HYDE PARK, MA 02189
CONTRACT NUMBER: F33615-87-C-2798
DR CARL SCHLAIKJER
TITLE:
IMPROVEMENT IN THE CAPACITY AND SAFETY OF LITHIUM/INOR ELECTROLYTE SULFUR DIOXIDE RECHARGEABLE CELLS
TOPIC# 127 OFFICE: AFWAL/PO

THE OBJECTIVE IS TO INCREASE THE CAPACITY AND SAFETY OF THE LITHIUM/LiAlCl4 - 6SO2/CARBON RECHARGEABLE CELL BY ALTERING THE ELECTROLYTE AND THE POSITIVE ELECTRODE, AND BY IMPROVING THE METHODS CURRENTLY EMPLOYED FOR MAKING THE ELECTROLYTE. ALUMINUM IS REMOVED AS DISCHARGE PROCEEDS, SINCE ONE OF THE PRODUCTS IS AN INSOLUBLE COMPLEX BETWEEN THE ALUMINUM, REDUCED SO2, AND THE CARBON SURFACE. THE DILEMMA IS THAT ADDING MORE ALUMINUM AS LiAlCl14, WHILE IT MIGHT IMPROVE THE CAPACITY, WOULD ALSO RAISE THE ELECTROLYTE FREEZING POINT TO AN UNACCEPTABLE HIGH LEVEL. WE PROPOSE TO CHANGE THE COMPOSITION OF THE ELECTROLYTE SUCH THAT THE LOW FREEZING POINT IS MAINTAINED, YET ADDING SOLUTES WHICH ARE LIKELY TO INCREASE THE CAPACITY. IN ADDITION, INSOLUBLE MATERIALS WHICH COULD BE INSTRUMENTAL IN IN-

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CREASING THE CAPACITY BY ENCOURAGING THE FORMATION OF COMPLEXES SIMILAR TO THE ONE WHICH FORMS ON THE KETJENBLACK NOW USED IN THESE CELLS WILL BE ADDED TO THE CARBON POSITIVE ELECTRODE. WE EXPECT IMPROVEMENTS IN SAFETY THROUGH THE ADDITION TO THE ELECTROLYTE OF MATERIALS WHICH WOULD IMPROVE THE MORPHOLOGY OF THE PLATED LITHIUM.

BATTERY ENGINEERING INC
1636 HYDE PARK AVE
HYDE PARK, MA 02189
CONTRACT NUMBER: F33615-87-C-2785
DR CARL SCHLAIKJER
TITLE:
A NEW LITHIUM/BROMINE SOLUBLE CATHODE RECHARGEABLE CEL
TOPIC# 127 OFFICE: AFWAL/PO

THE OBJECTIVE IS TO CONSTRUCT, CYCLE, AND EVALUATE PROTOTYPES OF THE TITLE CELL USING A NEWLY DISCOVERED ELECTROLYTE/SOLVENT SYSTEM WITH HIGH CONDUCTIVITY AND LOW FREEZING POINT WHICH IS CAPABLE OF ABSORBING LARGE QUANTITIES OF BROMINE WITHOUT DISSOLVING LITHIUM BROMIDE OR POLYBROMIDES. THE ELECTROLYTE IS THUS AT LEAST SUPERFICIALLY STABLE AGAINST METALLIC LITHIUM, WHICH WOULD BE EXPECTED TO FORM A COATING OF LITHIUM BROMIDE WHEN EXPOSED TO THE ELECTROLYTE. EXPERIMENTAL CELLS HAVE SHOWN THE THERMODYNAMICALLY PREDICTED OPEN CIRCUIT POTENTIAL OF 3.52 VOLTS, WHICH WOULD INDICATE A MINIMAL CORROSION RATE, AND THAT THE LITHIUM BROMIDE SALT FILM IS ACTING AS AN EFFECTIVE SOLID ELECTROLYTE INTERPHASE. THE EXPERIMENTAL CELLS HAVE EFFICIENTLY DISCHARGED AT AMBIENT TEMPERATURE AT RATES EXCEEDING 5mA/cm(2). IN THIS PROGRAM, WE PROPOSE TO TEST SEVERAL SOLVENTS BELONGING TO THE SAME CLASS OF COMPOUNDS AS THE ONE WHICH SHOWED PROMISE IN THE EXPERIMENTAL CELLS. WE WOULD MEASURE CAPACITY AND CYCLE LIFE AT 100% DEPTH OF DISCHARGE IN WOUND HERMETIC AA CELLS AT UP TO 5mA/cm(2), TEST RESISTANCE TO OVERCHARGE AND OVERDISCHARGE, AND MAKE A PRELIMINARY ESTIMATION OF SHELF LIFE BY STORING AT UP TO 55 DEG C.

BELTRAN INC
1133 E 35TH ST
BROOKLYN, NY 11210
CONTRACT NUMBER:
MICHAEL R BELTRAN
TITLE:
FIRE SUPPRESSANTS FOR COMPOSITE MATERIALS
TOPIC# 68 OFFICE: AFESC/RDXP

SUBMITTED BY

NEW AND PLANNED AEROSPACE AIRCRAFT ARE BEING CONSTRUCTED ON COMPOSITE MATERIALS WHICH UNDERGO UNCOMMON REACTIONS IN FIRE INCIDENTS. THEIR DECOMPOSITION PRESENTS POTENTIAL DAMAGE CAPABILITY TO ELECTRONIC COMPONENTS BEING EXPOSED AND A POTENTIAL HEALTH DANGER TO HUMANS IN THE VICINITY OF THE COMPOSITE MATERIALS DECOMPOSITION. IGNITION AND COMBUSTION OF THESE COMPOSITE MATERIALS CAN RESULT IN INCREASED FIRE HAZARD TO AEROSPACE AIRCRAFT FUELS, PROPELLANTS AND MUNITIONS. BURNING CHARACTERISTICS AND FIRE SUPPRESSION TECHNIQUES MAY BE DIFFERENT THAN THOSE OF KNOWN MATERIALS. THE PROPOSED EFFORT WILL IDENTIFY THE DECOMPOSITION AND BURNING CHARACTERISTICS OF COMPOSITE MATERIALS, EVALUATE EFFECTIVENESS OF CURRENT FIRE SUPPRESSANTS IN SUPPRESSING FIRES INVOLVING COMPOSITE MATERIALS AND DEVELOP NEW OR MODIFIED FIRE SUPPRESSANTS TO EFFECTIVELY CONTROL AND EXTINGUISH THIS TYPE OF FIRE AND ITS POTENTIAL COLLATERAL DAMAGE.

BIO-TECHNICAL RESOURCES INC
1035 S 7TH ST
MANITOWOC, WI 54220
CONTRACT NUMBER: F33615-87-C-5286
PAUL E SWANSON
TITLE:
A BIOLOGICAL APPROACH TO THE SYNTHESIS OF META-HYDROXY PHENYLACETYLENE FROM PHENYLACETYLENE
TOPIC# 101 OFFICE: AFWAL/ML

ACETYLENE-TERMINATED RESINS ARE ONE OF SEVERAL CANDIDATE POLYMERIC MATERIALS BEING DEVELOPED FOR POTENTIAL AEROSPACE APPLICATIONS. THE ACETYLENE-TERMINATED RESINS POSSESS PROPERTIES REQUIRED FOR THE PROPOSED APPLICATIONS SUCH AS TEMPERATURE, MOISTURE, AND SHEAR INSENSITIVITY. THE LIMITING FACTOR FOR THE COMMERCIAL MANUFACTURE OF THESE RESINS IN A COST-EFFECTIVE METHOD FOR THE SYNTHESIS OF AN ESSENTIAL CONSTITUENT, META-HYDROXY PHENYLACETYLENE. CHEMICAL APPROACHES TO THE SYNTHESIS OF META-HYDROXY PHENYLACETYLENE HAVE NOT RESULTED IN AN INEXPENSIVE PRODUCT OF ACCEPTABLE QUALITY. THE PHASE I RESEARCH PROGRAM OUTLINED IN THIS PROPOSAL TAKES A BIOLOGICAL APPROACHE TO THE PROBLEM. TWO POSSIBLE BIOLOGICAL ROUTES EXIST. ONE IS AN ENZYMATIC APPROACH. THE PROPOSED RESEARCH PROGRAM WILL SCREEN COMMERCIALLY AVAILABLE ENZYMES FOR THE ABILITY TO SELECTIVELY HYDROXYLATE PHENYLACETYLENE IN THE META POSITION. THE REACTION CON-

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DITIONS FOR THE SELECTED ENZYME SYSTEMS WILL BE OPTIMIZED. THERE IS PRECEDENCE IN THE LITERATURE FOR THE SELECTIVE ENZYMATIC HYDROXYLATION OF AROMATIC COMPOUNDS. THE SECOND BIOLOGICAL APPROACH IS A MICROBIOLOGICAL CONVERSION. A VARIETY OF MICROORGANISMS WILL BE SCREENED FOR THE ABILITY TO SELECTIVELY HYDROXYLATE PHENYLACETYLENE. THERE ARE NUMEROUS EXAMPLES IN THE LITERATURE OF MICROBIAL HYDROXYLATIONS OF SUBSTITUTED AROMATIC COMPOUNDS. THE GOAL OF THIS PROPOSED RESEARCH PROGRAM IS TO DETERMINE WHICH OF THESE TWO BIOLOGICAL APPROACHES WARRANT FURTHER DEVELOPMENT BASED ON ECONOMIC AND TECHNICAL DATA.

BIOMAGNETIC TECHNOLOGIES INC
4174 SORRENTO VALLEY BLVD
SAN DIEGO, CA 92121
CONTRACT NUMBER:
DR STEPHEN E ROBINSON
TITLE:
MAGNETOENCEPHALOGRAPHY BY LEAD FIELD SYNTHESIS
TOPIC# 78 OFFICE: AMD/RDO

THE SPONTANEOUS MAGNETOENCEPHALOGRAM (MEG) SIGNALS THAT ARE UNRELATED TO A STIMULUS OR A TASK, REPRESENT A FUNDAMENTAL BARRIER TO CONTINUING BRAIN RESEARCH. THIS BACKGROUND ACTIVITY CONSTITUTES A FORM OF INTERFERENCE, OR "BRAIN NOISE", THAT MASKS THE DESIRED WEAKER MEG SIGNALS EVOKED BY THE STIMULUS. PRESENT TECHNIQUES FOR ENHANCING THE EVOKED RESPONSE OF THE MEG SUCH AS SIGNAL AVERAGING, ARE NOT APPLICABLE TO SINGLE TRAIL MEG MEASUREMENTS. SUCH MEASUREMENTS ARE IMPORTANT TO OUR UNDERSTANDING OF HUMAN PERFORMANCE AND COGNITIVE PROCESSING BECAUSE THE BRAIN'S RESPONSE MAY BE MODULATED BY FACTORS SUCH AS ATTENTION AND WORK LOAD WHICH CAN CHANGE DYNAMICALLY. WE PROPOSE DEVELOPING A NEW TECHNIQUE, TERMED LEAD FIELD SYNTHESIS (LFS), WHICH INCORPORATES ALL THE MEG SIGNALS MEASURED FROM AN ARRAY OF SENSORS INTO A SINGLE MEASUREMENT. THIS "VIRTUAL SENSOR" ESTIMATES HOW MUCH OF THE OBSERVED MEG SIGNAL IS ATTRIBUTABLE TO A PARTICULAR LOCATION WITHIN THE BRAIN. LFS COMBINES ASPECTS OF SPATIAL SIGNAL AVERAGING, NOISE REDUCTION, AND INVERSE SOLUTION. WE WILL DEVELOP THE LFS TECHNIQUE FOR IMPROVING SNR IN MEG MEASUREMENTS. THIS PROJECT REPRESENTS A VITAL STEP TOWARD THE GOAL OF LOW-NOISE IMAGING OF BRAIN ELECTRICAL ACTIVITY.

SUBMITTED BY

BITE INC
0254 CENTER ST
MANASSAS, VA 22110
CONTRACT NUMBER: F33615-87-C-5317
JAMES R SHOWALTER
TITLE:
MODEL OF DESIGN PROCESS FOR ULCE IMPLEMENTERS
TOPIC# 90 OFFICE: AMD/RDO

THIS PROPOSAL ADDRESSES THE NEED TO DEVELOP A MODEL OF THE AVIONICS INDUSTRY DESIGN PROCESS FOR SELECTED GOVERNMENT PERSONNEL TO USE IN SUPPORT OF UNIFIED LIFE CYCLE ENGINEERING (ULCE) INITIATIVES. INFLUENCING THE DESIGN PROCESS TO ACCOUNT FOR ALL SUPPORTABILITY, PRODUCABILITY, PERFORMANCE, AND COST CONSIDERATIONS IS THE MOST HIGHLY LEVERAGED LIFE CYCLE COST OPPORTUNITY IN THE LIFE CYCLE OF A WEAPONS SYSTEM, AND IS THE OVERALL FOCUS OF ULCE. USERS NEED A WAY OF DETERMINING LIKELY BENEFITS OR COSTS RESULTING FROM PROPOSED IMPROVEMENTS AND MODIFICATIONS TO DESIGN OF AVIONICS FOR THE AIR FORCE. THE PROPOSAL IS TO INVESTIGATE ALTERNATE APPROACHES TO MODELING THE DOD AVIONICS DESIGN PROCESS USING VARIOUS RESOLUTION DISCRETE EVENT DETERMINISTIC VS. STOCHASTIC MODELS. AVIONICS DESIGN IS THE TARGET FOR THE PILOT PROGRAM, BUT THE RESULTS ARE LIKELY TO BE EXTENSIBLE TO OTHER DESIGN FIELDS.

BRIMROSE CORP OF AMERICA
7720 BELAIR RD
BALTIMORE, MD 21236
CONTRACT NUMBER: F33615-87-C-2136
DR RONALD G ROSEMEIER
TITLE:
A NOVEL IN-LINE ACOUSTIC GHz FIBER-OPTIC MODULATOR
TOPIC# 158 OFFICE: ASD/AE

THE OBJECTIVE OF THIS PROGRAM IS TO FABRICATE AN INLINE FIBER-OPTIC MODULATOR. WITH OUR EXPERIENCE IN BUILDING ACOUSTO-OPTIC DEVICES WE HAVE DEVELOPED A UNIQUE BONDING TECHNIQUE WHICH ALLOWS US TO BOND ANY PIEZOELECTRIC CRYSTAL TO ANY SUBSTRATE. IN THE LAST THREE YEARS,

SUBMITTED BY

BRIMROSE HAS BEEN A PIONEER IN DESIGNING AND CONSTRUTING ACOUSTO-OPTIC LASER BEAM DEFLECTORS. IN 1984, WE WERE THE FIRST COMPANY TO COMMERCIALLY INTRODUCE A 1-D 40% DIFFRACTION EFFICIENCY LASER BEAM DEFLECTOR FROM GALLIUM PHOSPHIDE (GaP) THAT OPERATES AT 1 GHz CENTER FREQUENCY WITH A DEFLECTION ANGLE OF 10 DEGREES FOR A HeNe LASER. IN PHASE I UTILIZING OUR PROPRIETARY BONDING TECHNIQUES WE WOULD LIKE TO BUILD SUCH A DEVICE IN WHICH A LiNbO3 LONGITUDINAL TRANSDUCER IS BONDED TO A BIREFRINGENT OPTICAL FIBER.

BROADCOM INC
400 PLAZA DR
SECAUCUS, NJ 07094
CONTRACT NUMBER: F9628-87-C-0179
JOSEPH KADIN
TITLE:
SYNAPSISTEM A SELF DIRECTIONAL COMMUNICATION SYSTEM AN EVALUATION
TOPIC# 36 OFFICE: ESD/XR

BROADCOM HAS DEVELOPED AN AUTOMATIC LOCATING, TRACKING AND MULTIPLE BEAM MICROWAVE COMMUNICATION SYSTEM WHICH IT HAS PRESENTED TO ESD WITH HIGH POSITIVE RESPONSE. A MAJOR ISSUE IS THE JAM IMMUNITY OF THE SYSTEM AGAINST THE ANTICIPATED THREAT. THIS EFFORT WILL INVOLVE THREE PHASES, THE ESTABLISHMENT OF THE THREAT, THE EVALUATION OF THE THREAT AGAINST AT LEAST TWO SYNAPSISTEM ARCHITECTURES AND A RED TEAM REVIEW BY ESD.

CAMBRIDGE RESEARCH & INSTRUMENTATION INC
21 ERIE ST
CAMBRIDGE, MA 02139
CONTRACT NUMBER:
PETER V FOUKAL
TITLE:
MESUREMENT OF MACROSCOPIC ELECTRIC FIELDS IN SOLAR PLA STRUCTURES
TOPIC# 183 OFFICE: AFGL/XOP

MACROSCOPIC ELECTRIC FIELDS PLAY A CENTRAL ROLE IN THE PROCESSES OF

SUBMITTED BY

RECONNECTION AND PARTICLE ACCELERATION THAT FIGURE PROMINENTLY IN SOLAR-TERRESTRIAL PHYSICS STUDIES OF FLARES AND FILAMENT ERUPTIONS. DETECTION OF THESE FIELDS AND MEASURMENT OF THEIR MAGNITUDE, ORIENTATION, SPATIAL DISTRIBUTION, AND TIME DEPENDENCE WOULD OPEN A NEW AREA OF INVESTIGATION IN SOLAR PLASMA DIAGNOSTIC TECHNIQUES. WE HAVE DEVELOPED A NEW TECHNIQUE FOR REMOTE SENSING THE MAGNITUDE AND ORIENTATION OF MACROSCOPIC ELECTRIC FIELDS HAVING A SUBSTANTIAL COMPONENT IN THE SKY PLANE, USING THE POLARIZATION-DEPENDENCE OF BALMER LINE STARK BROADENING. RESULTS SO FAR SUGGEST A DETECTABLE FIELD POSSIBLY ASSOCIATED WITH RECONNECTION IN AN EXCELLENT SET OF OBSERVATIONS OF A POST-FLARE LOOP. THE PHASE I WORK WE PROPOSE HERE WOULD EXTEND THESE SOLAR OBSERVATIONS TO A LARGER SAMPLE OF SOLAR STRUCTURES, AND TO THE PASCHEN LINES IN THE NEAR IR WHERE THE TECHNIQUE SHOULD BE MORE SENSITIVE. WE ALSO INTEND TO CARRY OUT LABORATORY MEASUREMENTS AT THE MIT TARA MIRROR MACHINE TO FURTHER REFINE AND CALIBRATE THIS TECHNIQUE OF PROBING PLASMA ELECTRIC FIELDS. OUR RESULTS WILL BE COMPARED TO THEORETICAL MODELS OF STATIC AND OSCILLATORY MACROSCOPIC E-FIELDS ASSOCIATED WITH RECONNECTION, PARTICLE ACCELERATION, AND PLASMA WAVES IN SOLAR STRUCTURES.

CASCADE MICROTECH INC
14155 SW BRIGADOON CT - STE B
BEAVERTON, OR 97005
CONTRACT NUMBER: F33615-87-C-1512
K REED GLEASON
TITLE:
NONINVASIVE ELECTRO-OPTIC PROBING FOR MMIC
TOPIC# 140 OFFICE: AFWAL/AA

THERE IS AN IMPLICIT NEED FOR THE ABILITY TO PROBE INTERNAL NODES IN GaAs MMIC'S TO FACILITATE DEVELOPMENT OF THESE STRATEGICALLY CRITICAL COMPONENTS. SYSTEMS USING THE ELECTRO-OPTIC EFFECT HAVE DEMONSTRATED OUTSTANDING PERFORMANCE IN THIS APPLICATION, BUT THESE SYSTEMS ARE EXPENSIVE AND DIFFICULT TO MAINTAIN AND USE. THE PROPOSED WORK WILL LEAD TO A SYSTEM BASED ON A CW LASER AND EXISTING AND HIGHLY DEVELOPED FREQUENCY-DOMAIN INSTRUMENTATION TO PROVIDE INTERNAL-NODE PROBING CAPABILITY AT FREQUENCIES UP TO 6 GHz. PHOTODETECTOR RESEARCH WILL BE PERFORMED AT OREGON STATE UNIVERSITY, AND OPTICAL COMPONENTS WILL BE COMBINED WITH CASCADE MICROTECH'S MICROWAVE PROBE STATION AND INSTRU-

SUBMITTED BY

MENTATION TO FORM A WORKING SYSTEM. THE PERFORMANCE OF THE SYSTEM WILL BE ANALYZED, METHODOLOGY FOR THE REQUIREMENTS ON COMPONENTS FOR EXTENDING THE BANDWIDTH AND SENSITIVITY WILL BE DETERMINED. THIS WILL FORM THE BASIS FOR THE DEVELOPMENT OF A 26 GHz PROBING SYSTEM IN PHASE II DEVELOPMENT.

CCE
PO BOX 9315
BERKELEY, CA 94709
CONTRACT NUMBER: F04701-87-C-0097
DR M J MALACHOWSKI
TITLE:
VOICE ACTIVATED INTERNALLY MOUNTED SPACESUIT HEAD-UP D
TOPIC# 166 OFFICE: AFSTC/OLAB

WE PROPOSE TO PROTOTYPE AN INTERNALLY MOUNTED FLAT PANEL COLOR LCD STEREO DISPLAY ASSEMBLY (SDA) TO SERVE AS A SPACE SUIT HEADS-UP DISPLAY (HUD), HELMET I. THE DISPLAY WILL BE CONNECTED TO OUR COMPUTER SYSTEM WHICH IS CAPABLE OF PROVIDING HIGH COLOR RESOLUTRON (32,768 COLORS), REAL TIME (60 FRAMES/SEC) IMAGES. IMAGES CAN BE OBTAINED FROM REMOTE CAMERAS, FROM MEMORY, OR BE GENERATED BY THE COMPUTER. TWO FULL COLOR IMAGE PLANES ARE AVAILABLE, ONE CAN BE A LIVE OR STORED VIDEO IMAGE AND THE OTHER IS AN OVERLAY PLANE FOR COMPUTER GENERATED OR STORED INFORMATION, DATA OR IMAGES. THE ASTRONAUT CAN CONTROL THE COMPUTER BY VOICE COMMAND. WE WILL PRODUCE "SHORTS" WHICH ARE SEQUENCES OF IMAGES WHICH VISIBLY AND AUDIBLY DETAIL HOW A PARTICULAR TASK IS ACCOMPLISHED. THESE SHORTS WILL BE STORED ON WORM OPTICAL DISKS ALONG WITH OTHER MAINTENANCE DATA. THE SYSTEM WILL INCREASE PRODUCTIVITY OF EVA TIME BY PROVIDING REALTIME STEREO IMAGES OF REQUISITE SEQUENCES FOR TASK COMPLETION. IT WILL DISPLAY ENVIRONMENTAL CONTROL AND LIFE SUPPORT AND MANNED MANEUVERING UNIT DATA OVER THE OTHER IMAGES OF REQUIRED TASKS WHILE THEY ARE BEING PERFORMED.

CEF INDUSTRIES INC
506 HIGHWAY 27 N
HAINES CITY, FL 33844
CONTRACT NUMBER: F33615-87-C-2159
WES LOTT
TITLE:
CONTROLLED COOLDOWN OF AIRCRAFT TURBINE ENGINES
TOPIC# 160 OFFICE: ASD/XR

SUBMITTED BY

AN "INTELLIGENT" MECHANISM TO CONTROL AIRCRAFT TURBINE ENGINE COOLDOWN UTILIZING INTEGRAL SENSORS, LOGIC, DRIVE AND FAIL-SAFE, FOR EXTENDING THE PERFORMANCE LIFE OF AIRCRAFT GAS TURBINE ENGINES IS PROPOSED. AIRCRAFT TURBINE ENGINES ARE PRECISELY MADE AND CONTROLLED MECHAISMS UNTIL SHUTDOWN. THEN, HEAT SOAK AND SOAKBACK PHENOMEN DELETERIOUSLY AFFECT ENGINE PERFORMANCE, LIFE, MAINTENANCE COSTS AND LIFE CYCLE COSTS. THE SELF-CONTAINED CONTROLLED AIRCRAFT TURBINE ENGINE COOLDOWN MECHANISM MOUNTS ON AN ACCESSORY GEARBOX PAD AND MAY BE RETROFIT AT ENGINE OVERHAUL. IT CAN BE TAILORED TO THE SPECIFIC AIRCRAFT/ENGINE COMBINATIONS. WE PROPOSE CONSTRUCTING FIVE (5) PRO-TOTYPES AND, IN CONJUNCTION WITH PARTICIPATING USAF COMMANDS AND AN ENGINE PRIME, DEVELOP THE EXPERIMENTAL DESIGN PROTOCOL(S) FOR EMPIRICALLY VALIDATING THE CONTROLLED ENGINE COOLDOWN UNIT ANTICI-PATED PERFORMANCE BENEFITS.

CERAMATEC INC
2425 S 900RD W
SALT LAKE CITY, UT 84119
CONTRACT NUMBER: F33615-87-C-3236
RAYMOND A CULTER
TITLE:
DEVELOPMENT OF A MICROCIRCUIT GRID TECHNIQUE FOR AUTOM
LENGTH MEASUREMENT FOR FATIGUE TESTING AT ELEVATED TEM
TOPIC# 110 OFFICE: AFWAL/FI

DEVELOPMENT AND APPLICATION OF A MICROCIRCUIT GRID TECHNIQUE FOR MEASURING CRACK LENGTHS IN FATIGUE CRACK GROWTH TEST SPECIMENS IS DESCRIBED. CRACK LENGTH IS DETERMINED FROM STEPWISE CHANGES IN THE VOLTAGE OUTPUT OF THE GRID CIRCUIT CAUSED BY THE SEQUENTIAL RUPTURE OF THE MICROSTRIPS BY THE ADVANCING CRACK TIP. THE ADVANTAGES OF THE GRID TECHNIQUE AS COMPARED TO OTHER TECHNIQUES FOR MONITORING CRACK LENGTHS INCLUDE: HIGH CRACK LENGTH RESOLUTION ("5 M) MADE POSSIBLE BY TODAY'S ADVANCED MICROCIRCUIT TECHNOLOGY, APPLICABILITY AT ELEVATED TEMPERATURES (1200 C) BY AN APPROPRIATED SELECTION OF THE CONDUCTING METAL STRIPS, LACK OF A NEED FOR QUANTITATIVE CALIBRATION OF THE VOLTAGE OUTPUT, AND THE COMPATIBILITY TO AUTOMATE THE DATA ACQUISITION AND ANALYSIS. DIRECT COMPARISON OF FATIGUE CRACK GROWTH RATES IN METALLIC SPECIMENS MEASURED BY THE GRID TECHNIQUE AND OTHER TECHNIQUES AND THE DEVELOPMENT OF A MULTIPLE GRID TECHNIQUE ARE THE

SUBMITTED BY

OBJECTIVES OF THE PHASE I EFFORT.

CLEVELAND CRYSTALS INC
19306 REDWOOD AVE
CLEVELAND, OH 44110
CONTRACT NUMBER: F33615-87-C-5285
DR WILLIAM R COOK
TITLE:
SELECTION AND GROWTH OF NEW OPTO-ELECTRONIC CRYSTALS
TOPIC# 92 OFFICE: AFWAL/ML

THERE IS AN ONGOING NEED FOR NEW OPTO-ELECTRONIC MATERIALS TO ADVANCE THE STATE OF EMERGING TECHNOLOGIES SUCH AS OPTICAL IMAGE PROCESSING, OPTICAL COMPUTING AND PARAGMETRIC OSCILLATION. ALTHOUGH MANY MATERIALS HAVE BEEN EXAMINED, ONLY A FEW ARE OUTSTANDING CANDIDATES FOR THESE APPLICATIONS. THE MOST PROMINANT ARE AGGAS2, AGGASE2, CDGEAS AND ZNGEP2. OTHER COMPOUNDS WILL PROBABLY EMERGE IN THE FUTURE. SELECTION HAS BEEN BASED ON PROPERTIES THAT LEAD TO A LARGE "FIGURE OF MERIT" COMBINED WITH SUITABLE TRANSMISSION, LOW ABSORPTION, LOW SCATTERING, GOOD THERMAL CONDUCTIVITY, HIGH DAMAGE THRESHOLD, AND OTHER DESIRABLE PROPERTIES. HOWEVER, MUCH LESS THOUGH HAS BEEN GIVEN TO THE ESSENTIAL CONSIDERATION OF WHETHER THESE CAN BE GROWN IN SUFFICIENT SIZE, QUALITY, AND QUANTITY. THIS PROPOSAL IS AIMED AT RE-EXAMINING THE MATERIALS SELECTION PROBLEM EMPHASIZING CRYSTAL-GROWTH FEASIBILITY. A CRITICAL ANALYSIS OF PAST EFFORTS SHOULD LEAD TO THE SELECTION OF SEVERAL "BEST CANDIDATE" POSSIBLY DUPLICATING SOME OF THE PRESENT CANDIDATES. WE ALSO PROPOSE TO CARRY OUT EXPERIMENTAL WORK ON SELECTED COMPOUNDS THAT WILL HOPEFULLY INDICATE THE FEASIBILITY OF PRODUCING LARGE, HIGH-QUALITY CRYSTALS THAT ARE CURRENTLY UNAVAILABLE.

COBBS ENGINEERING INC
5350 E 46TH ST - STE 200
TULSA, OK 74135
CONTRACT NUMBER:
JAMES H COBBS
TITLE:
EGRESS BORING MACHINE CUTTER DEVELOPMENT
TOPIC# 209 OFFICE: BMO/MYSC

SUBMITTED BY

THE PROGRAM GOALS FOR THE EGRESS BORING MACHINE REQUIRE A ROCK BORING SYSTEM WHICH WILL PRODUCE PENETRATION RATES OVER TEN TIMES GREATER THAN THOSE PRODUCED TO DATE UNDER SIMILAR CONDITIONS. THIS PROPOSAL IS TO DEVELOP A CUTTER SYSTEM WHICH USES THE CONCEPT OF AN INTERRUPTED DISC CUTTER. IT WILL TAKE FULL ADVANTAGE OF INDEXING BETWEEN CRATERS TO MAXIMIZE ROCK REMOVAL WHILE MINIMIZING THRUST REQUIREMENTS. SUCH REDUCTION WILL INCREASE THE LIFE OF BOTH THE CUTTING AND BEARING STRUCTURES. INTEGRAL TO THE STUDY IS THE DEVELOPMENT OF A REALISTIC MATHEMATICAL MODEL OF ROCK FAILURE MECHANICS DURING BORING. DEVELOPMENT OF THIS MODEL WILL PERMIT DEVELOPMENT OF AN OPTIMUM CUTTING STRUCTURE WHICH WILL HOLD PROMISE OF ACHIEVING THE PROGRAM GOALS. WITH DEVELOPMENT OF AN OPTIMUM CUTTING STRUCTURE, DESIGN OF THE REQUIRED BEARING AND SUPPORT STRUCTURES WILL BE POSSIBLE. SUCCESSFUL DEVELOPMENT OF THE PROPOSED CUTTER CAN PRODUCE SIGNIFICANT IMPROVEMENTS IN BORING TECHNOLOGY WHICH WILL ENHANCE BOTH ECONOMICS AND SAFETY OF SHAFT AND TUNNEL CONSTRUCTION.

COHERENT TECHNOLOGIES INC
3300 MITCHELL LN - STE 330
BOULDER, CO 80301
CONTRACT NUMBER:
R MILTON HUFFAKER
TITLE:
PARTIALLY COHERENT (WIDEBAND) INFRARED LIDAR SYSTEM FO
BASED AEROSOL BACKSCATTER AND CLOUD HEIGHT MEASUREMENT
TOPIC# 168 OFFICE: SD/SPO

BECAUSE OF LIMITATIONS IN DETECTOR TECHNOLOGY IT IS NOT CURRENTLY PRACTICAL TO OPERATE AN INCOHERENT SPACE LIDAR IN THE EYESAFE REGION FOR AEROSOL BACKSCATTER MEASUREMENT. THIS PROPOSED EFFORT COMBINES THE SIMPLICITY OF INCOHERENT LIDARS WITH THE EXTREME SENSITIVITY OF COHERENT DETECTION TO OBTAIN SENSITIVE PERFORMANCE IN THE EYESAFE INFRARED REGION. THIS EFFORT WILL DETERMINE THE FEASIBILITY, PERFORMANCE, AND DESIGN PARAMETERS OF A "SIMPLIFIED", PARTIALLY COHERENT (WIDEBAND), INFRARED LASER RADAR SYSTEM FOR AEROSOL BACKSCATTER AND CLOUD HEIGHT MEASUREMENTS FROM A SPACE PLATFORM OPERATING IN THE EYESAFE REGION. THE PARTIALLY COHERENT LIDAR SYSTEM WILL RETAIN THE HETERODYNE DETECTION PROCESS, AND THEREFORE THE LOCAL OSCILLATOR, OF A FULLY COHERENT LIDAR SYSTEM, BUT WILL HAVE RELAXED SPECIFICATIONS

SUBMITTED BY

IN THE AREAS OF TRANSMITTED PULSE FREQUENCY STABILITY, LOCAL OSCILLATOR FREQUENCY STABILITY, TRANSMITTED PULSE NARROW BANDWIDTH, RECEIVER NARROW BANDWIDTH, MECHANICAL AND OPTICAL TOLERANCES, AND DATA PROCESSING COMPLEXITY. IT WILL THEREFORE APPROACH THE SIMPLICITY OF AN INCOHERENT LIDAR SYSTEM BUT WILL BE MANY ORDERS OF MAGNITUDE MORE SENSITIVE IN THE EYESAFE, COVERT, INFRARED REGION ABOVE 1.4 MICRONS. IT IS EXPECTED THAT PARTIALLY COHERENT LIDAR SYSTEMS WILL BE IDEALLY SUITED TO THE PRESENT TECHNOLOGY IN SHORT-PULSE (WIDEBAND) INJECTION-SEEDED SOLID-STATE LASERS.

COHERENT TECHNOLOGIES INC
3300 MITCHELL LN - STE 330
BOULDER, CO 80301
CONTRACT NUMBER:
SAMMY W HENDERSON
TITLE:
DESIGN OF AN EFFICIENT COHERENT LONG-PULSE SOLID-STATE SPACE APPLICATIONS
TOPIC# 171 OFFICE: SD/SPO

THIS EFFORT WILL SHOW FEASIBILITY OF A COMPACT COHERENT SOLID-STATE LASER SOURCE RESULTING IN SIGNIFICANT ADVANTAGE OVER THE MASTER OSCILLATOR POWER AMPLIFIER (MOPA) CONFIGURATION, ESPECIALLY FOR SPACE-BASED OPERATION. THE PULSE-STRETCHED, SINGLE-LONGITUDINAL-MODE (SLM), SOLID-STATE SOURCE OPTIMIZES THE CURRENT LASER TECHNOLOGY FOR COMPACTNESS AND POWER EFFICIENCY, NECESSARY FEATURES OF A SPACE-BASED LIDAR. DOPPLER LIDAR WIND SENSORS REQUIRE HIGH ENERGY LASER PULSES FOR LONG RANGE. THE NEED FOR DOPPLER VELOCITY ACCURACY TYPICALLY REQUIRES COHERENT PULSES WHOSE DURATION IS GREATER THAN 1 MICROSECOND. CURRENT REALIZATION OF COHERENT LONG-PULSE OUTPUT FOR SOLID-STATE LASER SOURCES INVOLVES THE USE OF A HIGHLY STABLE, LOW ENERGY MASTER OSCILLATOR WHOSE OUTPUT IS THEN AMPLIFIED BY POWER AMPLIFICATION STAGES (MOPA). ALTHOUGH THIS TECHNIQUE IS EFFECTIVE, IT IS RELATIVELY LARGE IN SIZE AND ENERGY INEFFICIENT. WE PROPOSE TO DESIGN AN EFFICIENT LONG-PULSE SOLID-STATE LASER BY COMBINING THE BENEFITS OF INJECTION SEEDING AND PULSE STRETCHING. THIS EFFORT WOULD RESULT IN THE DESIGN OF AN EFFICIENT SLM SOLID-STATE LASER WITH PULSE DURATIONS UP TO SEVERAL MICROSECONDS AND FREQUENCY BANDWIDTHS OF LESS THAN 2 MHz.

SUBMITTED BY

COMPLERE INC
PO BOX 1697
PALO ALTO, CA 94302
CONTRACT NUMBER: F33615-87-C-3014
DR F K OWEN
TITLE:
TURBULENT SHEAR STRESS MEASUREMENTS IN HYPERSONIC FLOW
TOPIC# 120 OFFICE: AFWAL/FI

ALTHOUGH EXTENSIVE PROGRESS HAS BEEN MADE IN COMPUTATIONAL FLUID MECHANICS, RELIABLE FLIGHT VEHICLE DESIGNS AND MODIFICATIONS STILL CANNOT BE MADE WITHOUT RECOURSE TO EXTENSIVE WIND TUNNEL TESTING. FUTURE PROGRESS IN THE COMPUTATION OF HYPERSONIC FLOW FIELDS IS RESTRICTED BY THE NEED FOR A RELIABLE TURBULENCE MODELING DATA BASE WHICH COULD BE USED FOR THE DEVELOPMENT OF EMPIRICAL MODELS FOR USE IN NAVIER-STOKES CODES. CURRENTLY, THERE ARE FEW COMPRESSIBLE FLOW MEASURMENTS WHICH COULD BE USED FOR THIS PURPOSE AND, SINCE ADDITIONAL SHEAR STRESS TERMS MAY BE SIGNIFICANT AT HIGH MACH NUMBERS, MODELS BASED ON INCOMPRESSIBLE MEASUREMENTS MAY NOT BE REALISTIC. AN EVALUATION OF THESE ADDITIONAL TERMS WILL REQUIRE NEW EXPERIMENTAL METHODS. THE PURPOSE OF THIS PROPOSAL IS TO DEVELOP A TECHNIQUE WHICH COMBINES THE ADVANTAGES OF HOT WIRE AND LASER VELOCIMETRY FOR THE MEASUREMENT OF THE SHEAR STRESS TERMS IN HYPERSONIC FLOW.

COMPUTATIONAL MECHANICS CORP
3601 A CHAPMAN HWY
KNOXVILLE, TN 37920
CONTRACT NUMBER:
DR A J BAKER
TITLE:
A COMPREHENSIVE PNS UPGRADE FOR THREE-DIMENSIONAL REEN PREDICTION
TOPIC# 228 OFFICE: BMO/MYSC

THE MISSION OF THIS PHASE I PROJECT IS COMPLETION OF A TRULY INNOVATIVE STUDY TO UPGRADE EXISTING PNS CODES FOR COMPUTING HIGH-SPEED, THREE-DIMENSIONAL RE-ENTRY FLOWFIELDS. THE PLAN OF ACTION

SUBMITTED BY

ENCOMPASSES A THOROUGH EXAMINATION OF THE RANGE OF ADMISSABLE CFD THEORIES, TO UNEQUIVACALLY COMPARE STRONG AND WEAK POINTS FOR APPLICATION TO THE REYNOLDS-AVERAGED NAVIER-STOKES EQUATIONS WITH DIFFERENTIAL EQUATION TURBULENT CLOSURE MODEL. THE END-GOAL IS TO DEVELOP, FOR THIS HIGHLY NON-LINEAR NON-HOMOGENEOUS EQUATION SYSTEM, A SUPERIOR STABILITY ALGORITHM FREE OF DELETERIOUS NUMERICAL VISCOSITY EFFECTS, WITH PARTICULAR EMPHASIS ON HIGH-ORDER ACCURACY AT AERODYNAMIC BOUNDARY SURFACES, INTRINSIC ADMISSION OF HIGHER-ORDER TURBULENCE CLOSURE MODELS, INCLUSION OF REAL GAS EFFECTS, WITH ANTICIPATED EXTENSION TO CHEMICALLY REACTION/NON-EQUILIBIRUM FLOWS. THE RESULTANT CFD ALGORITHM WILL EXHIBIT ARBITRARY GRID CAPABILITIES AND BE HIGHLY TAILORED FOR EFFICIENT IMPLEMENTATION IN A MULTI-TASKING SUPERCOMPUTER AND/OR PARALLEL PROCESSING ENVIRONMENT.

COMPUTER TOOL & DIE SYSTEMS INC
900 VICTORS WY
ANN ARBOR, MI 48018
CONTRACT NUMBER: F33615-87-C-5308
BRIAN KUTTNER
TITLE:
EXPERT SYSTEM DEVELOPMENT TOOL FOR MANUFACTURING APPLI
TOPIC# 108 OFFICE: AFWAL/ML

THE OBJECT OF THIS RESEARCH EFFORT IS TO DEFINE THE SYNTAX, SEMANTICS AND COMPUTATIONAL REQUIREMENTS OF A KNOWLEDGE ENGINEERING TOOL CAPABLE OF SUPPORTING EXPERT SYSTEM DEVELOPMENT IN THE MANUFACTURING DOMAIN. THIS TOOL CALLED "MEX" (MANUFACTURING EXPERT) WILL ALLOW TASKS TO BE DEFINED THAT RELATED GEOMETRIC OBJECTS TO MECHANICAL PROCESSES AND WILL FORM THE BASIS OF A METHODOLOGY FOR CAPTURING AND STORING MANUFACTURING EXPERTISE IN A KNOWLEDGE BASE.

CREARE INC
PO BOX 71 - ETNA RD
HANOVER, NH 03755
CONTRACT NUMBER: F29601-87-C-0042
CHRISTOPHER J CROWLEY
TITLE:
DESIGN METHODS FOR TWO-PHASE FLOW AND HEAT TRANSFER IN
TOPIC# 200 OFFICE: AFWL/PRC

SUBMITTED BY

AN IMPORTANT RESULT OF THIS PROJECT WILL BE DOCUMENTED METHODS FOR DETERMINING FLOW REGIMES, CALCULATING THE HEAT TRANSFER COEFFICIENTS, AND STRUCTURING THE MOMENTUM AND ENERGY EQUATIONS TO DETERMINE PRESURE DROPS AND ENERGY TRANSPORT FOR TWO-PHASE FLOWS IN MICROGRAVITY. EXPERIMENTS WILL BE PERFORMED AT CREARE TO PROVIDE KEY LABORATORY DATA FOR SPACE APPLICATIONS (WHERE LOW GRAVITY EFFECTS CAN BE SIMULATED IN THE LABORATORY), AND EXPERIMENTAL HARDWARE WILL BE PREPARED FOR TESTING IN MICROGRAVITY.

CRYSTAL SYSTEMS INC
27 CONGRESS ST
SALEM, MA 01970
CONTRACT NUMBER: F33615-87-C-5291
CHANDRA P KHATTAK
TITLE:
GROWTH OF GaAs CRYSTALS BY TEM FOR MICROWAVE DEVICE AP
TOPIC# 93 OFFICE: AFWAL/ML

LARGE GaAs CRYSTALS WITH UNIFORM PROPERTIES AND LOW DEFECT DENSITIES ARE REQUIRED FOR MICROWAVE DEVICES FABRICATED FOR MILITARY SYSTEMS. THE VARIABLE QUALITY OF THE AVAILABLE GaAs, WAFER-TO-WAFER, INTRA WAFER, BOULE-TO-BOULE, AND INTRA BOULE IS UNSATISFACTORY FOR HIGH-YIELD DEVICE PROCESSING. WHILE THE ELECTRONIC PROPERTIES OF LEC GaAs CRYSTALS ARE SATISFACTORY, THESE WAFERS SHOW VERY HIGH DEFECT DENSITY. INDIUM-DOPED GaAs CRYSTALS SHOW LOW DEFECT DENSITY BUT EXHIBIT GROWTH STRIATIONS. THESE WAFERS ARE NOT SUITABLE FOR MICROWAVE DEVICES. THE HEAT EXCHANGER METHOD (HEMTM) HAS BEEN ADAPTED FOR THE GROWTH OF 2" DIAMETER AND 3" DIAMETER GaAs CRYSTALS. IT HAS BEEN DEMONSTRATED THAT UNDOPED (100) SEMI-INSULATING GaAs CRYSTALS CAN BE GROWN BY HEM WITH REMARKABLE UNIFORM ELECTRONIC PROPERTIES. IT HAS ALSO BEEN DEMONSTRATED THAT UPDOPED DISLOCATION-FREE GaAs CRYSTALS CAN BE GROWN BY HEM. AT THE PRESENT TIME, LINEAGE AND TWINNING ARE OBSERVED IN THE STRUCTURE OF 3" DIAMETER BOULES. THE LINEAGE IS ASSOCIATED WITH INCOMPLETE SEEDING AT THE OUTER EDGE OF THE SEED. THE PRESENT PROPOSAL IS TO OPTIMIZE SEEDING PARAMETERS WITH HEM TO ACHEIVE COMPLETE AND REPRODUCABLE SEEDING. THE PRODUCTION OF UNDOPED SEMI-INSULATING 3" DIAMETER (100) GaAs BOULES WITH UNIFORM CARRIER CONCENTRATION, EL2, AND MOBILITY ACROSS THE WAFER WILL BE RETAINED.

SUBMITTED BY

CRYSTALLUME
3180 PORTER DR - STE 2
PALO ALTO, CA 94304
CONTRACT NUMBER: 87-C-0327
DR J MICHAEL PINNEO
TITLE:
PE-CVD DIAMOND THIN FILM FOR RECYCLABLE UV SWITCH
TOPIC# 14 OFFICE: AD/MNF

THE RESEARCH ADDRESSED IN THIS PROPOSAL INVOLVES AN INVESTIGATION INTO THE USE OF DIAMOND THIN FILMS AS SOLID STATE OPTICAL SWITCHES WHERE THE FILMS ARE PRODUCED BY AN INHERENTLY LOW-COST TECHNIQUE EMPLOYING PLASMA-ENHANCED CHEMICAL VAPOR DEPOSITION (PE-CVD) OF CARBON-CONTAINING GASES (E.G., METHANE). THE OBJECTIVE OF THIS PROPOSED RESEARCH EFFORT IS TO EVALUATE EXPERIMENTALLY THE OPTO-ELECTRIC PROPERTIES OF PE-CVD DIAMOND THIN FILMS WITH RESPECT TO ITS PHOTOCONDUCTIVITY IN THE UV AND BLUE-GREEN SPECTRAL REGIONS. AS A RESULT OF SUCH EFFORTS WE WILL DETERMINE THE EXTEND TO WHICH DIA-MOND THIN FILMS MAY BE USED AS PHOTOCONDUCTORS AND ASCERTAIN THE FEASIBILITY OF DIAMOND BASED, UV-DRIVEN SWITCHES.

CRYSTALLUME
3180 PORTER DR - STE 2
PALO ALTO, CA 94304
CONTRACT NUMBER: FQ8671-8701510
DR J MICHAEL PINNEO
TITLE:
PE-CVD DIAMOND THIN FILM FOR RESEARCH INSTRUMENTATION
TOPIC# 241 OFFICE: AFOSR/XOT

THE OBJECTIVE OF THIS PROPOSED RESEARCH EFFORT IS TO EXPERIMENTALLY EVALUATE THE OPTOELECTRONIC PROPERTIES OF CHEMICAL VAPOR DEPOSITION DIAMOND THIN FILMS WITH RESPECT TO ELECTROLUMINESCENCE AND PHOTOCON-DUCTION IN THE UV AND BLUE-GREEN SPECTRAL REGIONS. AS A RESULT OF SUCH EFFORTS WE WILL DETERMINE THE EXTENT TO WHICH DIAMOND THIN FILMS MAY BE USED AS LASING MEDIA OR PHOTOCONDUCTORS AND ASCERTAIN THE FEASIBILITY OF DIAMOND BASED MICROLASERS.

SUBMITTED BY

CSA ENGINEERING INC
560 SAN ANTONIO RD - STE 101
PALO ALTO, CA 94306
CONTRACT NUMBER: F33615-87-C-3231
WARREN C GIBSON
TITLE:
FINITE ELEMENT MODELS FOR THE SUPPORTABILITY OF UNITED AIR FORCE AIRCRAFT STRUCTURES
TOPIC# 111 OFFICE: AFWAL/FI

A PROGRAM IS PROPOSED TO ACQUIRE, VALIDATE, STORE, MODIFY, AND DISSEMINATE FINITE ELEMENT MODELS OF AIR FORCE AIRCRAFT SYSTEMS, ALONG WITH ASSOCIATED DOCUMENTATION. THE PROPOSAL FORESEES A SIGNIFICANT INCREASE IN PRODUCTIVITY IN FINITE ELEMENT MODELING ACTIVITIES BROUGHT ABOUT BY THIS PROGRAM. CAREFUL DOCUMENTATION AND VERIFICATION OF MODELS WOULD MAKE IT POSSIBLE FOR SUBSEQUENT STUDIED INVOLVING THESE MODELS TO BE CARRIED OUT WITH GREATLY REDUCED EFFORT AND INCREASED CONFIDENCE. PHASE I IS PROPOSED AS A FEASIBILITY STUDY, EXAMINING CURRENT PRACTICES, RECOMMENDING A PLAN OF OPERATION FOR THE PROGRAM, AND ESTIMATING COST SAVINGS THAT WOULD BE ACHIEVED. THE STUDY WOULD ALSO ADDRESS PROBLEMS ASSOCIATED WITH DIFFERENT MODELS OF THE SAME SYSTEM THAT HAVE VARYING DEGREES OF REFINEMENT. PHASE II IS ENVISIONED AS A PILOT STUDY IN WHICH DATA FOR AN EXISTING SYSTEM IS OBTAINED, ANALYZED, STORED, AND MODIFIED. EVENTUAL ESTABLISHMENT OF THIS PROGRAM AS A PERMANENT AIR FORCE ACTIVITY IS ENVISIONED.

CSA ENGINEERING INC
560 SAN ANTONIO RD - STE 101
PALO ALTO, CA 94306
CONTRACT NUMBER: F33615-87-C-3239
DAVID A KIENHOLZ
TITLE:
SCALING OF LARGE SPACE STRUCTURE JOINTS
TOPIC# 113 OFFICE: AFWAL/FI

A PROGRAM IS PROPOSED TO INVESTIGATE METHODS FOR PRODUCING SUBSCALE

SUBMITTED BY

TRUSS JOINTS WITH STIFFNESS AND DAMPING PROPERTIES SUCH THAT THEY MAINTAIN DYNAMIC SIMILITUDE WITH THEIR FULL-SCALE COUNTERPARTS. THAT IS, THE LOSS FACTORS OF THE MODEL AND PROTOTYPE ARE EQUAL AND THEIR LINEAR STIFFNESS ARE IN THE RATIO R(E)R(L). R(E) AND R(L) ARE RESPECTIVELY THE MODEL-TO-PROTOTYPE RATIOS OF MATERIAL ELASTIC MODULI AND LENGTHS. A DEMONSTRATION EXERCISE WILL BE ATTEMPTED TO SHOW THAT SIMILITUDE CAN BE ACHIEVED FOR A SELECTED JOINT DESIGN BY MEANS WHICH ARE CHEAPER AND MORE PRACTICAL THAN EXACT GEOMETRIC PROPORTIONALITY. STRUCTURAL OPTIMIZATION METHODS AND SOFTWARE WILL BE USED TO DESIGN A SUBSCALE JOINT THAT HAS SPECIFIED PROPERTIES, BUT IS SIMPLER AND CHEAPER IN CONSTRUCTION THAN A MINIATURE REPLICA. STIFFNESS AND LOSS FACTOR WILL BE MEASURED FOR THE FULL-SCALE PROTOTYPE AND SUB-SCALE MODEL.

CSA ENGINEERING INC
560 SAN ANTONIO RD - STE 101
PALO ALTO, CA 94306
CONTRACT NUMBER:
KEVIN E SMITH
TITLE:
DYNAMIC PRESSURE RESPONSE CALIBRATOR
TOPIC# 22 OFFICE: AEDC/DOT

MEASURING DYNAMIC PRESSURES IN TURBINE AND ROCKET ENGINES ARE OFTEN MADE BY SEPARATING THE TRANSDUCING ELEMENT FROM THE MEASUREMENT POINT WITH TUBING. THE TUBING IS USED FOR THERMAL ISOLATION AND/OR WHEN THERE ARE SIZE CONSTRAINTS. THE ACOUSTIC PROPERTIES OF THE TUBES REQUIRE THE TUBING AND SENSOR UNIT BE CALIBRATED TOGETHER AS A SYS-TEM. CURRENT CALIBRATORS ARE RESTRICTED IN ULTIMATE PEAK PRESSURE, BANDWIDTH, ACCURACY, AND TYPE OF EXCITATION SOURCE. IT IS PROPOSED TO DESIGN, BUILD, AND TEST A LABORATORY-SCALE CALIBRATION SYSTEM WITH FLEXIBLE EXCITATION SOURCES (SWEPT-SINE OR RANDOM), HIGH BANDWIDTH (2-500 Hz), AND HIGH PEAK PRESSURE (1 psi). THE CALIBRTOR WILL UTILIZE A HIGH-OUTPUT ACOUSTIC DRIVER WHOSE OUTPUT IS CONTROLLED BY A DIGITAL SERVO-CONTROLLER. IN ADDITION TO PROVIDING A PRECISELY CONTROLLED EXCITATION, A TWO-CHANNEL MEASUREMENT (SENSOR OUTPUT DUE TO DRIVING PRESSURE AT TUBING INPUT) WILL PRODUCE A VERY ACCURATE MEASUREMENT BOTH IN TERMS OF AMPLITUDE AND PHASE.

CVD EQUIPMENT CORP
160-B W INDUSTRY CT
DEER PARK, NY 11729
CONTRACT NUMBER:
BILL GARTMAN
TITLE:
LARGE CAPACITY ABRUPT JUNCTION MOCVD EPITAXIAL REACTOR
TOPIC# 58 OFFICE: RADC/XPX

SUBMITTED BY

PRESENT TECHNOLOGY USED TO FORM EPITAXIAL LAYERS OF III-V COMPOUNDS IS LIMITED TO TRADITIONAL ATMOSPHERIC AND REDUCED PRESSURE MO-CVD REACTORS WHICH FAIL TO ACHIEVE THE DEGREE OF LAYER ABRUPTNESS REQUIRED OF SUPER LATTICE STRUCTURES OR MOLECULAR BEAM EPITAXY (MBE) REACTORS WHICH SUFFER FROM LIMITED THROUGHOUT CAPABILITY. THE DEVELOPMENT PROGRAM OUTLINED IN THIS WORK IS AIMED AT DEVELOPING A MULTI-SLICE, RAPID SWITCHING, MO-CVD REACTOR SYSTEM WHICH CAN BE USED TO GROW III-V COMPOUND SEMICONDUCTOR LAYERS WITH ATOMIC LAYER ABRUPTNESS. THE TECHNIQUE BEING EXPLORED UTILIZES ATOMIC LAYER EPITAXY (ALE) TO SELECTIVELY DEPOSIT SINGLE ATOMIC LAYERS OF GROUP III AND GROUP V MATERIALS. BY RAPIDLY SWITCHING THE SUBSTRATES BETWEEN SOURCES, THE CRYSTAL LATTICE OF THE SEMICONDUCTOR LAYER CAN BE BUILT-UP WITH THE HIGHEST DEGREE OF CONTROL. THIS FEASIBILITY STUDY WILL BE CONDUCTED USING A 3-ONE INCH DIAMETER SUBSTRATOR REACTOR- PHASE II WILL BE THE DEVELOPMENT OF A REACTOR CAPABLE OF 10-THREE INCH DIAMETER SUBSTRATES. A COMPREHENSIVE STUDY IS PERFORMED IN WHICH A COMPARISON IS MADE BETWEEN THE EFFECTS OF RAPID GAS VERSUS SUBSTRATE POSITION SWITCHING.

CVD EQUIPMENT CORP
160-B E INDUSTRY CT
DEER PARK, NY 11729
CONTRACT NUMBER: F33615-87-C-1483
BILL GARTMAN
TITLE:
LARGE CAPACITY ABRUPT JUNCTION MOCVD EPITAXIAL REACTOR
TOPIC# 147 OFFICE: AFWAL/AA

PRESENT TECHNOLOGY USED TO FORM EPITAXIAL LAYERS OF III-V COMPOUNDS IS LIMITED TO TRADITIONAL ATMOSPHERIC AND REDUCED PRESSURE MO-CVD REACTORS WHICH FAIL TO ACHIEVE THE DEGREE OF LAYER ABRUPTNESS REQUIRED OF SUPER LATTICE STRUCTURES OF MOLECULAR BEAM EPITAXY (MBE) REACTORS WHICH SUFFER FROM LIMITED THROUGHOUT CAPABILITY. THE DEVELOPMENT PROGRAM OUTLINED IN THIS WORK IS AIMED AT DEVELOPING A MULTI-SLICE, RAPID SWITCHING, MO-CVD REACTOR SYSTEM WHICH CAN BE USED TO GROW III-V COMPOUND SEMICONDUCTOR LAYERS WITH ATOMIC LAYER ABRUPTNESS. THE TECHNIQUE BEING EXPLORED UTILIZES ATOMIC LAYER EPITAXY (ALE) TO SELECTIVELY DEPOSIT SINGLE ATOMIC LAYERS OF GROUP III AND GROUP V MATERIALS. BY RAPIDLY SWITCHING THE SUBSTRATES BETWEEN

SUBMITTED BY

SOURCES, THE CRYSTAL LATTICE OF THE SEMICONDUCTOR LAYER CAN BE BUILT-UP WITH THE HIGHEST DEGREE OF CONTROL. THIS FEASIBILITY STUDY WILL BE CONDUCTED USING A 3-ONE INCH DIAMETER SUBSTRATOR REACTOR-PHASE II WILL BE THE DEVELOPMENT OF A REACTOR CAPABLE OF 10-THREE INCH DIAMETER SUBSTRATES. A COMPREHENSIVE STUDY IS PERFORMED IN WHICH A COMPARISON IS MADE BETWEEN THE EFFECTS OF RAPID GAS VERSUS SUBSTRATE POSITION SWITCHING.

CYBER-OPTICS CORP
2331 UNIVERSITY AVE SE
MINNEAPOLIS, MN 55414
CONTRACT NUMBER: F33615-87-C-1484
LYNN D HUTCHESON
TITLE:
HIGH SPEED RANDOM ACCESS CAMERA
TOPIC# 148 OFFICE: AFWAL/AA

THERE ARE MANY MILITARY AND COMMERCIAL APPLICATIONS WHERE VERY HIGH SPEED AND HIGH RESOLUTION SIGNAL PROCESSING, COMPUTING, IMAGE PROCESSING AND VISION SYSTEMS ARE DESIRABLE. CURRENT SYSTEMS ARE SEVERELY LIMITED BY DEVICES THAT REQUIRE RELATIVELY LONG TIMES TO GET INFORMATION INTO AND OUT OF THE SYSTEM. APPLICATIONS SUCH AS SURVEILLANCE, TRACKING, PROCESS MONITORING, QUALITY CONTROL AND MANY OTHERS, ARE REQUIRING HIGHER AND HIGHER RESOLUTION. IT IS DIFFICULT TO PROCESS THE DATA FROM A HIGH RESOLUTION CAMERA IN REAL TIME. WE PROPOSE TO EXAMINE THE USE OF A RANDOM ACCESS CAMERA, ONE IN WHICH PIXELS ARE INDIVIDUALLY ADDRESSABLE, TO PRODUCE A VARIABLE RESOLUTION CAMERA WHICH WOULD BE CAPABLE OF FINE AND COARSE RESOLUTION IMAGING UNDER SOFTWARE CONTROL. WE WILL INVESTIGATE METHODS FOR RANDOMLY ADDRESSING THE ARRAY OF DETECTORS ELECTRICALLY, AS WELL AS OPTICALLY. A SIMULATION OF THE BEHAVIOR OF SUCH CAMERAS WILL BE MADE TO DETERMINE THE ADVANTAGES OF RANDOM ACCESS TECHNOLOGY OVER STANDARD VIDEO TECHNOLOGY. A RANDOM ACCESS CAMERA OPERATING IN THE VISIBLE TO THE NEAR-INFRARED WAVELENGTH REGION WITH INDIVIDUAL PIXEL ACCESS TIME OF ONE MICROSECOND OR LESS IS A MUCH-NEEDED DEVICE FOR OPTICAL PROCESSOR AND OPTICAL COMPUTING OPERATION.

CYBERCOM RESEARCH CORP
2555 PARK BLVD - STE 8
PALO ALTO, CA 94306
CONTRACT NUMBER: F19628-87-C-0176
ARTHUR COOK
TITLE:
DEVELOPMENT OF A COTS BASED MLS TRUSTED GATEWAY WITH R
REQUIREMENTS
TOPIC# 36 OFFICE: ESD/XR

SUBMITTED BY

NEW COMMAND AND CONTROL SYSTEMS CONSIST OF COMPLEX NETWORKS OF DISTRIBUTED PROCESSING ELEMENTS, WORKSTATIONS, AND DATA BASES. MANY OF THESE SYSTEMS, SUCH AS WIS, USAFE INCOMNET, AND MAC GDSS HAVE IDENTIFIED REQUIREMENTS FOR A MLS/TRUSTED GATEWAY INTERFACE DEVICE TO PROVIDE AUTOMATED INTERCONNECTION TO SYSTEMS AT OTHER SECURITY LEVELS. THE DDN SECURITY ARCHITECTURE HAS IDENTIFIED A SIMILAR REQUIREMENT TO INTERCONNECT SYSTEM SEGMENTS. THE OBJECTIVE OF THIS SBIR PROGRAM IS TO DEMONSTRATE AN APPROACH TO IMPLEMENTING THIS CAPABILITY ON A COTS HARDWARE BASE, WITH SIGNIFICIANT REDUCTION IN THE SIZE OF THE TCB OVER PREVIOUS APPROACHES. THE APPROACH IS BASED ON THE MODULAR SECURITY CONCEPTS DEVELOPED ON THE RADC MULTINET PROGRAM, WHICH WAS IMPLEMENTED ON A UNIQUE HARDWARE BASE BECAUSE TECHNOLOGY TO SUPPORT THE DESIGN WAS NOT AVAILABLE. RECENT ADVANCES IN MICROPROCESSOR BUS ARCHITECTURE NOW ALLOW THE CONCEPTS TO BE APPLIED TO A MORE COST EFFECTIVE COTS HARDWARE BASE. NEW CHIP LEVEL ENCRYPTION TECHNOLOGY WILL BE UTILIZED TO REDUCE THE AMOUNT OF TRUSTED SOFTWARE REQUIRED, USING TECHNIQUES ORIGINALLY PROPOSED FOR SECURE DATA BASE SYSTEMS.

DECISION-SCIENCE APPLICATIONS INC
1901 N MOORE ST - STE 1000
ARLINGTON, VA 22209
CONTRACT NUMBER:
PHILIP G TOMLINSON
TITLE:
SIMULATION OF BISTATIC TARGET DETECTION IN CLUTTER
TOPIC# 37 OFFICE: RADC/XPX

THE TECHNICAL OBJECTIVES OF THE PHASE I PROGRAM ARE TO DEVELOP INNOVATIVE MODELING AND SIMULATION APPROACHES TO THE PROBLEM OF BISTATIC TARGET DETECTION IN CLUTTER. PHENOMENA TO BE CONSIDERED ARE TO INCLUDE WAVEFORM CHARACTERISTICS, TARGET AND CLUTTER SCATTERING PHENOMENA, AND SIGNAL PROCESSING. FOR THE PROPOSED RESEARCH, DSA PLANS TO FOLLOW A LOGICAL AND METHODICAL APPROACH TO SATISFYING THE TECHNICAL OBJECTIVES. UNDER PHASE I, DSA SHALL IDENTIFY THE TYPES OF MODELS AND SIMULATIONS REQUIRED AND PROCEED TO PERFORM NECESSARY MATHEMATICAL REPRESENTATION AND SOFTWARE PLANNING AND DESIGN SHORT OF ACTUAL PROGRAMMING. FURTHERMORE, DSA SHALL PLAN THE PHASE II EFFORT IN SUCH A WAY AS TO AVOID DUPLICATION WITH EXISTING SIMULATIONS.

SUBMITTED BY

DECISION-SCIENCE APPLICATIONS INC
1901 N MOORE ST - STE 1000
ARLINGTON, VA 22209
CONTRACT NUMBER: F04701-87-C-0116
JERRY E BELYEA
TITLE:
COHERENT OPERATION OF A DISTRIBUTED SPARSE ARRAY SPACE
TOPIC# 173 OFFICE: SD/SPO

A PROGRAM IS PROPOSED FOR THE ASSESSMENT OF TECHNIQUES FOR PROVIDING COHERENT OPERATION AND BEAM SYCHRONIZATION IN A DISTRIBUTED SPARSE ARRAY RADAR SYSTEM. THE RADAR SYSTEM CONSIDERED WOULD ADDRESS WIDE AREA SURVEILLANCE MISSIONS AND FUNCTIONS FROM SPACE USING TECHNOLOGY IDENTIFIED IN THE USAF FORECAST II STUDY RECENTLY COMPLETED. THE EFFORT WILL EVALUATE SEVERAL CANDIDATE TECHNIQUES INCLUDING LASER CROSSLINKS, PHASE MATCHING USING KNOWN GROUND TARGETS AND ACCURATE LOCATION OF DISTRIBUTED ELEMENTS USING A DIFFERENTIAL TECHNIQUE EMPLOYING SIGNALS FROM THE GLOBAL POSITIONING SYSTEM SATELLITES. COMPARATIVE ASSESSMENTS OF CANDIDATE TECHNIQUES WILL BE PERFORMED USING ANALYTIC TECHNIQUES AND COMPUTER MODELS DEVELOPED IN PAST RESEARCH. THE PHASE I EFFORT WILL DESCRIBE AND EVALUATE TECHNIQUES; SELECT THE MOST PROMISING; AND DEVELOP PLANS FOR A PHASE II GROUND EXPERIMENT TO DEMONSTRATE THE KEY ELEMENTS OF THE APPROACH.

DECISION-SCIENCE APPLICATIONS INC
1901 N MOORE ST - STE 1000
ARLINGTON, VA 22209
CONTRACT NUMBER: F04701-87-C-0115
JERRY E BELYEA
TITLE:
SIGNAL PROCESSING ARCHITECTURE FOR A DISTRIBUTED SPARS
RADAR SYSTEM
TOPIC# 177 OFFICE: SD/SPO

A PROGRAM IS PROPOSED FOR THE ASSESSMENT OF TECHNIQUES FOR PROVIDING COHERENT OPERATION AND BEAM SYCHRONIZATION IN A DISTRIBUTED SPARSE ARRAY RADAR SYSTEM. THE RADAR SYSTEM CONSIDERED WOULD ADDRESS WIDE

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AREA SURVEILLANCE MISSIONS AND FUNCTIONS FROM SPACE USING TECHNOLOGY IDENTIFIED IN THE USAF FORECAST II STUDY RECENTLY COMPLETED. THE EFFORT WILL EVALUATE SEVERAL CANDIDATE TECHNIQUES INCLUDING LASER CROSSLINKS, PHASE MATCHING USING KNOWN GROUND TARGETS AND ACCURATE LOCATION OF DISTRIBUTED ELEMENTS USING A DIFFERENTIAL TECHNIQUE EMPLOYING SIGNALS FROM THE GLOBAL POSITIONING SYSTEM SATELLITES. COMPARATIVE ASSESSMENTS OF CANDIDATE TECHNIQUES WILL BE PERFORMED USING ANALYTIC TECHNIQUES AND COMPUTER MODELS DEVELOPED IN PAST RESEARCH. THE PHASE I EFFORT WILL DESCRIBE AND EVALUATE TECHNIQUES; SELECT THE MOST PROMISING; AND DEVELOP PLANS FOR A PHASE II GROUND EXPERIMENT TO DEMONSTRATE THE KEY ELEMENTS OF THE APPROACH.

DEFENSE RESEARCH ASSOCS INC
5915 HUBERVILLE AVE
DAYTON, OH 45431
CONTRACT NUMBER: F33615-87-C-2160
M B CLAUSING
TITLE:
AVIONICS DESIGN TOOL CONCEPTS
TOPIC# 160 OFFICE: ASD/XR

THE PROPOSED PROGRAM WILL EXPLORE WHAT IS REQUIRED TO DEVELOP AN AVIONICS DESIGN TOOL THAT CAN BE USED IN CONJUNCTION WITH AIR VEHICLE DESIGN TOOLS TO PERMIT RAPID AND TIMELY ANALYSIS OF AVIONICS, ESPECIALLY SENSOR AVIONICS, IMPACTS ON AIR VEHICLE DESIGNS AND THE IMPACT OF AIR VEHICLE DESIGNS ON AVIONICS SENSOR SUITES.

DEFENSE SYSTEMS INC
7903 WESTPARK DR
McLEAN, VA 22102
CONTRACT NUMBER: F04701-87-C-0110
DR RICHARD FLEETER
TITLE:
EXPANDING THE APPLICATIONS OF MINIATURE SATELLITE TECH
TOPIC# 167 OFFICE: AFSTC/OL-AB

WHILE LARGE, COMPLEX AND EXPENSIVE SATELLITE SYSTEMS WILL REMAIN THE ONLY MEANS TO ACHIEVE MANY MISSION REQUIREMENTS MINIATURE SATELLITES

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HAVE DEMONSTRATED THE CAPABILITY TO REPLACE LARGE SYSTEMS FOR CERTAIN APPLICATIONS. MINIATURE SATELLITE TECHNOLOGY (MST) LOWERS COST BY REDUCING SATELLITE ENGINEERING AND FABRICATION COSTS AS WELL AS REDUCING LAUNCH COST DUE TO MUCH LOWER SATELLITE WEIGHT. DEFENSE SYSTEMS IS THE ONLY SATELLITE MANUFACTURER TO HAVE PROVEN THE POTENTIAL OF THE MST CONCEPT FOR MILITARY APPLICATION. OUR GLOBAL LOW ORBITING MESSAGE RELAY (GLOMR) DIGITAL MESSAGE RELAY SATELLITE PROVIDED 2.5 TIMES ITS DESIGN SERVICE LIFETIME WHILE DEMONSTRATING THE UNIQUE CAPABILITIES OF THE MINIATURE SATELLITE CONCEPT. IT WAS DESIGNED, LAUNCHED AND OPERATED FOR UNDER $1 MILLION AND ITS DERIVATIVES ARE BEING PRODUCED FOR $300,000 TO $500,000. MASTER GROUND STATION AND REMOTE TERMINAL COSTS ARE PROPORTIONATELY LOW COMPARED TO CONVENTIONAL SYSTEMS. PROCUREMENT OF A SATELLITE SYSTEM BECOMES AFFORDABLE FOR MANY MILITARY UNITS. AN EXPERIMENT CAN BE OPERATED VIA PERSONAL COMPUTER BY TECHNICIANS WITHIN A SPECIFIC ORGANIZATION. WITH THE ULTIMATE GOAL OF USING MINIATURE SATELLITES IN PLACE OF MORE COSTLY CONVENTIONAL SYSTEMS, APPLICATIONS USING A STANDARDIZED, SMALL BUS AS WELL AS COMMUNICATIONS, SENSOR, AND A WIDE VARIETY OF TEST PLATFORM PAYLOADS CAN SIGNIFICANTLY REDUCE THE COST AND LEAD TIME FOR USAF ACCESS TO SPACE.

DESIGN ENGINEERING CORP
4725 LUMBER AVE NE - STE 1
ALBUQUERQUE, NM 87109
CONTRACT NUMBER: F29601-87-C-0048
HANS J TAUSCH JR
TITLE:
HIGH POWER MICROWAVE (HPM) INTEGRATED CIRCUIT SCREENIN
TOPIC# 196 OFFICE: AFWL/PRC

UNDER THIS CONTRACT, WE WILL DEVELOP A FUNDAMENTAL UNDERSTANDING OF THE EFFECTS OF HIGH POWER MICROWAVE (HPM) SIGNALS ON INTEGRATED CIRCUITS. SPECIFIC OBJECTIVES INCLUDE: 1) ANALYZE AND FAIL COMPONENTS TO DEVELOP AN UNDERSTANDING OF THE FAILURE PROCESSES, 2) MODEL SELECTED PARTS AND DEVELOP RESPONSE PREDICTION TOOLS, 3) DESIGN TESTS TO QUANTITATIVELY MEASURE AND SEPARATE VARIOUS PHENOMENA, 4) DESIGN PRINTED CIRCUIT LEVEL TESTS TO MEASURE THE RESPONSE OF PARTS 'IN SITU', AND 5) DESIGN THE INSTRUMENTATION SYSTEM AND TEST FIXTURES. FUTURE PHASES OF WORK WILL VERIFY THE ANALYSIS AND HARDNESS ASSURANCE

SUBMITTED BY

SCREENS DEVELOPED UNDER THIS CONTRACT.

DEVELOPMENT SYSTEMS & RSCH CORP (DSARC)
9990 LEE HWY - STE 140
FAIRFAX, VA 22030
CONTRACT NUMBER: F29601-87-C-0047
DR B EUGENE SIMMONS
TITLE:
CONCEPTUAL DEVELOPMENT OF SURVIVABLE NETWORKING FOR TH
SPARSE ARRAY SPACECRAFT
TOPIC# 199 OFFICE: AFWL/PRC

THIS PROPOSES PHASE I OF A TWO-PHASE ANALYSIS EFFORT, WHOSE OVERALL OBJECTIVE IS TO INVESTIGATE OPTIONS AND TECHNIQUES FOR SURVIVABLE ADAPTIVE NETWORK FOR A DISTRIBUTED ARRAY OF SPACECRAFT (DAS) SYSTEM, FOR FOLLOW-ON DEVELOPMENT. PHASE I WILL IDENTIFY PROMISING APPROACHES, CONDUCT LIMITED ASSESSMENTS, AND IDENTIFY ISSUES FOR MORE DETAILED INVESTIGATION IN PHASE II. A DAS SYSTEM CONSISTS OF SMALL, INEXPENSIVE SATELLITES ("MINI-SPACECRAFT") THAT WORK IN UNISON TO PROVIDE THE CAPABILITY OF A SURVIVABLE MISSION FUNCTION. POTENTIAL DAS SYSTEM MISSION APPLICATIONS INCLUDE COMMUNICATIONS AND SENSING. A SURVIVABLE ADAPTIVE NETWORK (SAN) IS ESSENTIAL FOR A DAS SYSTEM TO BE IMPLEMENTED, IN ORDER THAT DAS MINI-SPACECRAFT CAN WORK TOGETHER, WITH ANY ONE MINI-SPACECRAFT HAVING THE CAPABILITY TO BE A MASTER. IN ADDITION, IT IS ESSENTIAL THAT THEY MAINTAIN TIME SYNCHRONISM SUCH THAT HIGH DATA RATE TRAFFIC CAN BE ACCOMMODATED. LINK PERFORMANCE IN STRESSED ENVIRONMENTS, INTERCONNECTIVITY OF LINKS, AND MULTIMEDIA TRANSMISSION ARE ESSENTIAL INGREDIENTS OF A SAN.

DIGITAL RADIO CORP
601 S PACIFIC COAST HWY
REDONDO BEACH, CA 90277
CONTRACT NUMBER: F19628-87-C-0180
O W SAUNDERS
TITLE:
DIGITALLY IMPLEMENTED HF/VHF RECEIVER DEVELOPMENT
TOPIC# 36 OFFICE: ESD/ICC

SUBMITTED BY

THE DIRAD TEAM HAS IDENTIFIED A DIGITALLY IMPLEMENTED RECEIVER ARCHITECTURE THAT PROVIDES UNIQUE PERFORMANCE CAPABILITIES PRESENTLY UNATTAINABLE IN CONVENTIONAL ANALOG RECEIVER IMPLEMENTATIONS; BAND-PASS FILTER CHARACTERISTICS, WIDEBAND AGC OPERATION, NOISE REDUCTION/ ADAPTABILITY, MULTIPLE INTEGRATED CONFIGURATIONS, IMPROVED A/J PER-FORMANCE, AND GREATLY REDUCED ILS POTENTIAL ARE INCLUDED. THIS PRO-POSAL DESCRIBES A TWO-PHASE EFFORT THAT LEDS TO THE FULL-SCALE DE-MONSTRATION OF A DIGITALLY IMPLEMENTED RECEIVER CAPABLE OF RECEIVING WEAK SIGNALS AMONGST NOISE, OPERATION BY MULTIPLE USERS, FIRMWARE PROGRAMMABLE AND CONFIGURABLE INTO FREQUENCY HOPPING OR DIRECT SE-QUENCE MODES OF OPERAITON. THE PHASE I EFFORT INCLUDES THE DEFINI-TION, DESIGN AND ANALYSIS TASKS THAT LEAD TO A FORMAL PRELIMINARY DESIGN REVIEW. PHASE II IS FOR THE DETAIL DESIGN, CRITICAL DESIGN REVIEW, FABRICATION, ASSEMBLY, LABORATORY AND FIELD TESTING OF A FULL-SCALE PORTABLE DIGITALLY IMPLEMENTED HF/VHF RECEIVER.

DISPLAYTECH INC
2200 CENTRAL AVE - STE C
BOULDER, CO 80301
CONTRACT NUMBER:
MARK HANDSCHY
TITLE:
PROGRAMMABLE OPTICAL SPATIAL FILTERS USING ARRAYS OF F
LIQUID CRYSTAL LIGHT VALVES
TOPIC# 63 OFFICE: RADC/XPX

THE PROPOSED WORK AIMS TO DEVELOP PROGRAMMABLE OPTICAL SPATIAL FILTERS USING NOVEL SPATIAL LIGHT MODULATORS (SLM) MADE FROM LINEAR ARRAYS OF FERROELECTRIC LIQUID CRYSTAL (FLC) LIGHT VALVES. THE FLC TECHNOLOGY ALLOWS SIMPLE, ECONOMICAL FABRICATION OF SLMs WITH A LARGE NUMBER OF ELEMENTS THAT CAN EASILY BE ADDRESSED EITHER ELECTRONICALLY OR OPTICALLY. THE ELEMENTS EFFICIENTLY SWITCH INCIDENT LIGHT WITH SUBMICROSECOND RESPONSE TIMES. PHASE I OF THE PROPOSED EFFORT SEEKS TO SHOW THE FEASIBILITY OF USING THESE SLMs AS PROGRAMMABLE SPATIAL MASKS BY DEMONSTRATING HIGH CONTRAST 106 (60 dB INTENSITY) AND 20ms WRITE TIME IN A 128 ELEMENT ELECTRICALLY ADDRESSED ONE-DIMENSIONAL SLM. DURING PHASE II, HIGHER SPEED SLMs WITH A LARGE NUMBER OF ELEMENTS WILL BE DEVELOPED; THE POSSIBILITY OF USING THE FLC SLM AS AN (POTENTIALLY OPTICALLY ADDRESSED) INPUT DEVICE WILL ALSO BE

SUBMITTED BY

CONSIDERED AT THIS TIME.

DISPLAYTECH INC
2200 CENTRAL AVE - STE C
BOULDER, CO 80301
CONTRACT NUMBER: 733615-87-C-5293
MARK HANDSCHY
TITLE:
MATERIALS FOR FERROELECTRIC LIQUID CRYSTAL INTEGRATED SWITCHES
TOPIC# 92 OFFICE: AFWAL/ML

FERROELLECTRIC LIQUID CRYSTALS EXHIBIT LOW VOLTAGE, LOW POWER ELECTRO-OPTIC SWITCHING WITH VERY FAST (MICROSECOND) RESPONSE. FLCS CAN BE EMPLOYED IN A SIMPLE GEOMETRY TO MAKE ARRAYS OF ELECTRO-OPTIC WAVEGUIDE COUPLING SWITCHES, SUITABLE FOR MULTI-INPUT, MULTI-OUTPUT APPLICATIONS. THE PROPOSED WORK WOULD DEVELOP LIQUID CRYSTAL, WAVEGUIDE, AND INTERFACE MATERIALS FOR THIS APPLICATION

DWA COMPOSITE SPECIALTIES INC
21119 SUPERIOR ST
CHATSWORTH, CA 91311
CONTRACT NUMBER: F33615-87-C-5281
DR WILLIAM C HARRIGAN JR
TITLE:
MATRIX ALLOY DEVELOPMENT FOR GRAPHITE/ALUMINUM SPACE S
TOPIC# 103 OFFICE: AFWAL/ML

THE USE OF GRAPHITE/MAGNESIUM COMPOSITES FOR SPACE STRUCTURES WITH ZERO THERMAL EXPANSION CHARACTERISTICS HAS BEEN HAMPERED BY THE HYSTERESIS CAUSED BY MATRIX YIELDING. THIS HYSTERESIS HAS BEEN ELIMINATED IN LABORATORY SAMPLES BY HEAT TREATING THE COMPOSITE TO OBTAIN A MATRIX YIELD STRENGTH IN EXCESS OF 40 KSI FOR ALUMINUM MATRIX COMPOSITES. THE REQUIRED HEAT TREATMENT WILL BE IMPRACTICAL WHEN LARGE (15 METER LONG TUBES) STRUCTURES ARE MANUFACTURED. THIS PROJECT WILL DEVELOP A NON HEAT-TREATABLE MATRIX ALLOY FOR GRAPHITE/ MAGNESIUM COMPOSITES THAT WILL HAVE A HIGH ENOUGH YIELD STRENGTH TO ELIMINATE HYSTERESIS AFTER MODIFIED HEAT TREAT CYCLES. THE COMPO-

SUBMITTED BY

SITES WILL BE MADE WITH THE DWG PROCESS THAT RESULTS IN IMPROVED INFILTRATION AND MINI- STRUCTURE COMPARED WITH PRESENT TECHNIQUES. THIS TECHNIQUE CAN EASILY USE MATRIX ALLOYS WITH MODIFICATIONS THAT IMPROVE FIBER WETTING. THE PHASE I EFFORT WILL DEFINE USEFUL MATRIX ALLOYS COMBINATIONS AS WELL AS PRODUCE 8-INCH BY 8-INCH BY 8-PLY COMPOSITE PLATES WHICH EXHIBIT LOW THERMAL EXPANSION WITH ZERO HYSTERESIS. THE IMPROVEMENT IN FIBER DISTRIBUTION AND MATRIX WETTING WILL BE DEMONSTRATED. THE PHASE II EFFORT WILL TRANSLATE THE MATRIX ALLOY TECHNOLOGY INTO 4-FOOT TUBE STRUCTURES WITH A FIBER ORIENTATION TO PRODUCE ZERO (OR NEGATIVE) THERMAL EXPANSION WITH ZERO HYSTERESIS.

DYNA EAST CORP
3201 ARCH ST
PHILADELPHIA, PA 19104
CONTRACT NUMBER: 87-C-0360
ROBERT D CICCARELLI
TITLE:
REDUCING THE SENSITIVITY OF DIRECTED ENERGY WARHEADS T
STIMULI
TOPIC# 1 OFFICE: AFATL/MNN

MANY EXPLOSIVE WARHEADS ARE SENSITIVE TO INITIATION BY FRAGMENT OR BULLET IMPACT AND SYMPATHETIC DETONATION. DIRECTED-ENERGY WARHEADS IN PARTICULAR ARE OFTEN LOADED WITH VERY ENERGETIC EXPLOSIVE TO OBTAIMANCE AT THE EXPENSE OF INCREASE SENSITIVITY. THE OBJECTIVE OF THE PROPOSED PROGRAM IS TO DETERMINE THE MOST EFFECTIVE APPROACH TO REDUCING THE SENSITIVITY OF AN EXISTING WARHEAD, SUCH AS THE SFW OR TOW 2. THE REDUCTION IN SENSITIVITY WILL BE ACCOMPLISHED BY SUB-STITUTING AN INSENSITIVE EXPLOSIVE AND THEN REDESIGNING THE WARHEAD CONFIGURATION TO YIELD THE SAME PENETRATION PERFORMANCE. ALTER-NATIVELY, THE CURRENT EXPLOSIVE WILL BE RETAINED BUT THE WARHEAD CASING WILL BE REDESIGNED TO REDUCE SENSITIVITY. ATTENTION MUST BE GIVEN TO 1) THE PENETRATOR PERFORMANCE; 2) WARHEAD SENSITIVITY TO IMPACT; AND 3) COST AND MANUFACTURABILITY. WARHEAD DESIGNS USING EACH APPROACH WILL BE GENERATED, AND A FEASIBILITY DEMONSTRATION WILL BE PERFORMED DURING WHICH TWO CANDIDATE DESIGNS WILL BE BUILT AND TESTED. CONCLUSION WILL BE REACHED REGARDING THE FEASIBILITY FOR THE APPROACHES CHOSEN.

DYNAMIC CONTROLS INC
7060 CLIFFWOOD PL
DAYTON, OH 45424
CONTRACT NUMBER: F33615-87-C-3408
DR GAVIN D JENNEY
TITLE:
INTEGRATED TEST SYSTEM - AIRCRAFT GROUND OPERATION STU
TOPIC# 116 OFFICE: AFWAL/ML

SUBMITTED BY

THE OBJECTIVE OF THE PROJECT IS TO DETERMINE A SATISFACTORY METHOD OF CONDUCTING AIRCRAFT LANDING GEAR TESTS IN THE AFWAL FLIGHT DYNAMICS LABORATORY LAND GEAR DEVELOPMENT FACILITY (LGDF) AS AN INTEGRATED PART OF PILOTED LARGE AMPLITUDE MULTIMODE AEROSPACE RESEARCH SIMULATOR (LAMARS) AIRCRAFT SIMULATIONS. TO ACCOMPLISH THIS OBJECTIVE, A STUDY WILL BE CONDUCTED OF THE TWO FACILITIES AND THE REQUIRED INTERFACE. THE STUDY WILL DOCUMENT THE PERFORMANCE PARAMETERS AND RANGE NECESSARY FOR INTEGRATED TESTING. SUITABILITY OF THE CURRENT LDGF FACILITY FOR ACCOMPLISHING INTEGRATED TESTING WILL BE ANALYZED AND APPROPRIATE MODIFICATIONS FOR EXISTING EQUIPMENT AND/OR REQUIRED NEW EQUIPMENT ESTABLISHED. THE DATA TRANSMISSION METHOD BETWEEN FACILITIES AND THE DESIGN WILL BE ESTABLISHED. THE RESULTS OF THE STUDY WILL DOCUMENT THE GENERAL DESIGN OF THE INTEGRATED SYSTEM, CHANGES TO THE LDGF FACILITY AND AN ESTIMATED COST FOR THE INSTALLED SYSTEM.

E-TEK DYNAMICS INC
250 EAST DR - STE D
MELBOURNE, FL 32904
CONTRACT NUMBER:
J J PAN
TITLE:
HIGH DYNAMIC RANGE EXTERNAL MODULATOR
TOPIC# 43 OFFICE: RADC/XPX

MILITARY AND SPACE SYSTEMS DEMAND HIGH DYNAMIC RANGE (DR), LOW DISTORTION 60 GHz ELECTRO-OPTIC MODULATOR (EOM). TO IMPROVE EOM LINEARITY AND DR, E-TEK PROPOSES THE USE OF COMBINED TECHNIQUES OF THIRD-HARMONIC COMPENSATING FUNDAMENTAL NONLINEARLITY, AUTOMATIC GAIN CONTROL OF THE EOM DRIVER, MINIMIZATIONS OF PHASE ERROR/OPTICAL DAMAGE/LASER NOISES, OPTIMIZATIONS OF EOM GAP AND VOLTAGE/MODULATION DEPTH, IMPROVEMENT OF VELOCITY MATCHING, ETC. THE HEMT OR MESFET IS ALSO PROPOSED AS AN EFFICIENT 60 GHz PHOTODETECTOR WITH AMPLIFICATION GAIN TO IMPROVE DR. FURTHERMORE, IN PHASE I RD&D, E-TEK SUGGESTS FINDING A TEST METHOD OR EQUIPMENT WHICH IS CAPABLE OF MEASURING WIDE DR AT 60 GHz. THE POSSIBLE ACHIEVABLE SINGLE-TONE DR OF EOM IS 122 dB/Hz, AND TWO-TONE DR IS 105 TO 118 dB/Hz.

E-TEK DYNAMICS INC
250 EAST DR
MELBOURNE, FL 32904
CONTRACT NUMBER:
J J PAN
TITLE:
FIBER OPTIC SENSORS OF ELECTRICAL AND MAGNETIC FIELDS
TOPIC# 59 OFFICE: RADC/XPX

SUBMITTED BY

THREE ULTRA WIDEBAND, SENSITIVE FIBER OPTIC SENSORS OF ELECTRIC/ MAGNETIC FIELDS ARE PROPOSED: (1) UP TO 70 GHz ELECTRIC FIELD SENSOR USING GaAs OR LiNbO(3) EOM WITH AN INTEGRATED ANTENNA ELEMENT; (2) ELECTRO-MAGNETIC FIELD SENSOR USING AN INTEGRATED "LOADED" LOOP FABRICATED ON LiNbO(3) OR GaAs SUBSTRATE; (3) MAGNETIC FIELD SENSOR USING Bi(12)Ge0(20) OR Cd(1-X)Mn(X)Te FARADAY CELL. DEVICES/COMPONENTS PARAMETERS, SENSITIVITY, FREQUENCY RANGE, SYSTEM BUDGET, PERFORMANCE PREDICTIONS, ETC., WILL BE INCLUDED IN THE R&D STUDY/DESIGN/COMPUTATION. RUGGED PACKAGED AND FIBER-SENSOR INTERFACE WILL BE INVESTIGATED TO WITHSTAND THE OPERATIONAL ENVIRONMENT.

E-TEK DYNAMICS INC
250 EAST DR
MELBOURNE, FL 32904
CONTRACT NUMBER: F33615-87-C-1488
J J PAN
TITLE:
COMPACT HIGH EFFICIENCY MULTIAPERTURE BROAD SPECTRUM S
TOPIC# 155 OFFICE: AFWAL/AA

HYPERSONIC INTERCEPTORS REQUIRE COMPACT, HIGH EFFICIENCY MULTI-APERTURE BROADBAND SENSORS TO DETECT/IDENTIFY STEALTH VEHICLES. E-TEK PROPOSES A MULTI-BEAM PHASED-ARRAY SYSTEM COVERING RF FREQUENCIES OF 100 MHz TO 60 GHz AND INFRA-RED OPTICAL WAVELENGTHS. THE 100 MHz TO 60 GHz SUBSYSTEM IS AN OPTICALLY CONTROLLED MULTI-BEAM PHASED-ARRAY USING PROGRAMMABLE MASKING TECHNIQUE. THIS TECHNIQUE CAN REDUCE SIZE/WEIGHT/COST/POWER CONSIDERABLY, BECAUSE IT DOES NOT REQUIRE PHASE SHIFTERS AND/OR COMPLEX WEIGHTS. THE OPTICAL MULTI-BEAM PHASE-ARRAY SUBSYSTEM CONSISTS OF LASER DIODES AND INTEGRATED OPTIC PHASE SHIFTERS. THE INTEGRATED PHASE SHIFTERS ARE ELECTRONICALLY CONTROLLABLLE, AND ARE MASS PRODUCIBLE. E-TEK WILL DESIGN AND OPTIMIZE THE PHASE-ARRAY SYSTEM IN PHASE I R&D, AND IT WILL LEAD TO PHASE II HARDWARE FABRICATIONS/EVALUATION.

EARTH TECHNOLOGY CORP
3777 LONG BEACH BLVD
LONG BEACH, CA 90807
CONTRACT NUMBER:
DR BILL LU
TITLE:
GRAVITY EFFECTS IN SMALL SCALE STRUCTURAL MODELING
TOPIC# 72 OFFICE: AFESC/RDXP

SUBMITTED BY

THE OBJECTIVE OF THE PROPOSED RESEARCH IS TO DEVELOP CONCEPTS AND PROCEDURES WHICH CAN COMPENSATE FOR GRAVITY EFFECTS (WITHOUT USING ARTIFICIALLY-INDUCED GRAVITY) IN SMALL SCALE ONE-G MODEL TESTS SIMULATING THE EFFECTS OF CLOSE-IN AND SHALLOWLY BURIED DETONATION OF NONNUCLEAR WEAPONS ON PROTECTIVE STRUCTURES. THE SUCCESS OF THIS PROPOSED PROGRAM WILL LEAD TO THE IMPROVED DESIGN/UPGRADE METHODOLOGIES FOR PROTECTIVE STRUCTURES SUBJECTED TO NONNUCLEAR WEAPONS ATTACKS. THE PROPOSED PROGRAM WILL ACCOMPLISH THE OBJECTIVE BY ESTABLISHING APPROPRIATE SCALING RELATIONSHIPS FOR SMALL SCALE ONE-G MODELING THROUGH LITERATURE EVALUATION, DIMENSIONAL ANALYSIS AND DEVELOPMENT OF A MATERIALS SIMULANT DATA BASE. THE FEASIBILITY AND APPLICABILITY OF THE DEVELOPED ONE-G MODELING TECHNIQUES WILL BE FURTHER STRENGTHENED BY A PARALLEL INVESTIGATION OF POTENTIAL MEANS FOR ARTIFICAL MODIFICATION OF MATERIAL PROPERTIES, SUPPORTING ANALYTICAL AND EXPERIMENTAL PROCEDURES, AND IMPROVED MONITORING TECHNIQUES. IT IS ANTICIPATED THAT THE RESULTS OF PHASE I PROGRAM WILL ESTABLISH COST-EFFECTIVE AND TECHNICALLY SOUND ONE-G MODELING CONCEPTS (AND COMPLEMENTARY SUPPORTING TECHNIQUES) TO SIMULATE NONNUCLEAR WEAPONS EFFECTS FOR A WIDE RANGE OF CONDITIONS. THE DEVELOPED CONCEPTS AND TECHNIQUES CAN BE TESTED IN THE PHASE II STUDY. THE RESULTS CAN THEN BE VALIDATED BY COMPARING THEM WITH THE RESULTS OF WELL DOCUMENTED, FULL SCALE OR CENTRIFUGE MODEL TESTS.

ECLECTECH
PO BOX 177
OAK RIDGE, TN 37830
CONTRACT NUMBER:
PATRICK A MARCH
TITLE:
LEAK DETECTION BY ACOUSTIC EMISSIONS MONITORING
TOPIC# 70 OFFICE: AFESC/RDXP

A BENCH SCALE TESTING PROGRAM IS PROPOSED TO EVALUATE THE FEASIBILITY OF DEVELOPING A PORTABLE SYSTEM FOR THE PASSIVE ACOUSTIC DETECTION OF LEAKS FROM UNDERGROUND PIPES AND STORAGE TANKS. THE WORK WILL EMPLOY THE USE OF PIEZOELECTRIC FILM IN A NOVEL SENSOR DESIGN FOR THE DETECTION OF ACOUSTIC WAVES IN SOILS AND MATERIALS HAVING IRREGULAR SURFACES. EMPHASIS WILL BE PLACED ON EVALUATING THE EFFECTS OF VARYING SOIL CONDITIONS, SOURCE/SENSOR GEOMETRY, AND

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LEAK EMISSION CHARACTERISTICS. THE GOAL OF THE WORK IS THE CREATION OF AN ACOUSTIC SIGNATURE DATA BASE FOR A PORTABLE, SURFACE OPERATED, INTELLIGENT, MICROCOMPUTER-BASED SYSTEM FOR DETECTION OF UNDERGROUND LEAKS.

EIDETICS INTERNATIONAL INC
3669 W 240TH ST
TORRANCE, CA 90505
CONTRACT NUMBER: FQ8671-8701407
GERALD N MALCOLM
TITLE:
AN INNOVATIVE APPROACH TO NON-OBTRUSIVE QUANTITATIVE M
OF VORTEX FLOWS
TOPIC# 241 OFFICE: AFOSR/XOT

MODERN FIGHTER AIRCRAFT ARE OPERATING IN A FLIGHT REGIME WITH INCREASING DEMANDS FOR MANEUVERABILITY AND CONTROLLABILITY TO BE EFFECTIVE IN THE COMBAT ARENA. ONE OF THE LIMITATIONS TO THAT EFFECTIVENESS IS THE INABILITY TO ACCURATELY TRACK TARGETS FOR GUN OR MISSILE SHOTS DUE TO THE DEGRADING CHARACTERISTICS OF WING ROCK. WING ROCK IS A SELF-INDUCED, LIMIT-CYCLE OSCILLATION IN ROLL, SOMETIMES ACCOMPANIED BY COUPLED OSCILLATIONS IN YAW, THAT OCCURS NEAR THE STALL ANGLE OF ATTACK. THE PURPOSE OF THIS STUDY IS TO THOROUGHLY INVESTIGATE THE WING-ROCK CHARACTERISTICS OF ONE MODERN FIGHTER. THE RESEARCH PLAN WILL ANALYZE AND CORRELATE FLIGHT TIME HISTORIES, THE CORRESPONDING AERODYNAMIC DATA BASE, RESULTS FROM BASIC FLUID MECHANICS EXPERIMENTS INCLUDING WATER-TUNNEL FLOW VISUALIZATION STUDIES OF A MODEL PERFORMING A WING-ROCK MOTION, AND A 6-DOF STUDY TO ASSESS THE IMPORTANCE OF SPECIFIC AERODYNAMIC PARAMETERS. SUCCESS IN THE ANALYSIS OF ONE AIRCRAFT WILL PROVIDE THE OPPORTUNITY TO EVALUATE OTHER MODERN AIRCRAFT AND, ALONG WITH ONGOING BASIC RESEARCH IN WING-ROCK FLOW PHENOMENA, WILL PROVIDE THE METHODOLOGY FOR PREDICTING AND AVOIDING WING ROCK IN THE DESIGN PHASES OF NEW AIRCRAFT OR IMPROVING EXISTING AIRCRAFT, EITHER THROUGH AERODYNAMIC MEANS OR IMPROVED CONTROL SYSTEMS. THE SELECTED CANDIDATE FOR THE PHASE I STUDY IS THE F-18 AIRCRAFT. AIRCRAFT TO FOLLOW MIGHT INCLUDE THE F-4, F-14, F-15, AND F-16.

EIDETICS INTERNATIONAL INC
3669 W - 240TH ST
TORRANCE, CA 90505
CONTRACT NUMBER: F33615-87-C-0192
ROBERT W FOLTYN
TITLE:
G LOSS OF CONSCIOUSNESS (G-LOC) DETECTION WARNING AND
FOR TACTICAL AIRCRAFT IN THE COMBAT SCENARIO
TOPIC# 160 OFFICE: ASD/XR

SUBMITTED BY

INCIDENTS OF G-INDUCED LOSS OF CONSCIOUSNESS (G-LOC) OCCUR WITH ALARMING FREQUENCY IN TODAY'S HIGH PERFORMANCE TACTICAL AIRCRAFT AND POSE A SIGNIFICANT HAZARD TO FLIGHT SAFETY. IT IS CLEAR THAT THE NUMBER OF G-LOC RELATED MISHAPS NOW OCCURING IN THE PEACE-TIME TRAINING ENVIRONMENT IS ONLY A FRACTION OF WHAT MIGHT BE EXPECTED IN COMBAT OR WITH ADVANCED FIGHTERS WITH IMPROVED MANEUVERING PERFORMANCE. THE ABILITY OF MILITARY AIRCREWS TO FUNCTION UNDER HIGH G AND G ONSET RATES DIRECTLY IMPACTS THE SAFETY, MISSION EFFECTIVENESS, AND MANEUVERING CAPABILITY OF CURRENT TACTICAL AIRCRAFT. PREVIOUS STUDY AND DEVELOPMENT EFFORTS HAVE SOUGHT SOLUTIONS TO THE G-LOC PROBLEM THROUGH PREVENTATIVE MEASURES AND HAVE FOCUSED ONLY ON THE PEACE TIME TRAINING OR TEST ENVIRONMENT. THIS PROJECT IS BASED UPON THE ULTIMATE REQUIREMENT FOR SOLUTION WITH APPLICATIONS IN COMBAT AND WHERE PREVENTATIVE MEASURES HAVE FAILED. SPECIFIC OBJECTIVES FOR THIS STUDY INCLUDE THE DEFINITION AND EVALUATION OF G-LOC DETECTION, WARNING AND RECOVERY SYSTEM.

ELECTROCHEM INC
PO BOX 1189
BOSTON, MA 02117
CONTRACT NUMBER: F33615-87-C-2166
DAVID P BLOOMFIELD
TITLE:
ELECTROCHEMICALLY DRIVEN HEAT PUMP
TOPIC# 160 OFFICE: ASD/XR

THE EDHP, USP 4,593,534 IS AN ELECTROCHEMICALLY DRIVEN HEAT PUMP. THE EDHP IS A SPIN-OFF OF SPACE FUEL CELL TECHNOLOGY. SPECIFICALLY, SUPPLYING POWER TO THE EDHP PUMPS A UNIQUE WORKING FLUID THROUGH A REFRIGERATION SYSTEM. THE EDHP'S ELECTROCHEMICAL COMPRESSOR REPLACES THE MECHANICAL COMPRESSOR IN A CONVENTIONAL SYSTEM. THE MAJOR DIFFERENCE BETWEEN THE EDHP AND CONVENTIONAL SYSTEM IS THAT THE EDHP'S ELECTROCHEMICAL COMPRESSOR CAN BE BUILT IN CAPACITIES FROM LESS THAT A WATT TO MEGAWATTS. IT CAN ALSO PUMP LIQUIDS AS WELL AS GASES. THE FIRST EDHP PROTOTYPE WAS BUILT AND SUCCESSFULLY TESTED BY ELECTROCHEM IN MID 1985. IN OUR ONGOINGS, INDUSTRIALLY SPONSORED PROGRAMS WE HAVE SHOWN THAT THE EDHP CAN PUMP AMMONIA. WE BELIEVE THAT MAJOR ADVANCES OVER CONVENTIONAL TECHNOLOGY MAY BE ATTAINABLE THROUGH THE APPLICATION OF THE EDHP TO ELECTRONIC COOLING. THE EDHP

SUBMITTED BY

HAS POTENTIAL COST, WEIGHT, SIZE, NOISE AND SIMPLICITY ADVANTAGES OVER CONVENTIONAL SYSTEMS.

ELECTROCHIMICA CORP
20 KELLY CT
MENLO PARK, CA 94025
CONTRACT NUMBER: 87-C-0328
DR S REISNER
TITLE:
NEW HIGH ENERGY AND POWER STORAGE DEVICES FOR FUZES
TOPIC# 13 OFFICE: AFATL/MNF

STORAGE OF ELECTRICAL ENERGY AT A SUFFICIENTLY HIGH DENSITY, IN A SMALL ENOUGH VOLUME AND WITH HIGH ENOUGH EFFICIENCY OF EXTRACTION IS INCRESINGLY BECOMING A SIGNIFICANT PROBLEM. CONVENTIONAL CAPACITIVE DEVICES (E.G., ELECTROLYTIC CAPACITORS) FALL SHORT OF PROVIDING THE VOLUMETRIC EFFICIENCY REQUIRED TO SUPPORT NEW TECHNOLOGIES FOR COMPLEX FUZE REQUIREMENTS. WE PROPOSE TO DEVELOP AN ENERGY STORAGE DEVICE WHICH COMBINES THE BEST FEATURES OF HIGH ENERGY DENSITY RECHARGEABLE LITIUM NON-AQUEOUS BATTERIES WITH THE HIGH DISCHARGE RATE CAPABILITY OF CAPACITORS TO CREATE AN INNOVATIVE RECHARGEABLE ENERGY STORAGE DEVICE WITH BOTH GLAVANIC AND CAPACITIVE PROPERTIES. SPECIFICALLY, THE RECENT DEVELOPMENT OF EXTRAORDINARILY HIGH SURFACE AREA (1500 M2/G) ACTIVE CARBON FIBER (ACF) NON-WOVEN CLOTH, ORIGINALLY INTENDED FOR AIR PURIFICATION SYSTEMS, HAS YIELDED A NOVEL BATTERY PLATE MATERIAL. PLACEMENT OF A SUITABLY DOPED ACF ELECTRODE OPPOSITE A HIGH ENERGY DENSITY LITHIUM ANODE IN A HIGH CONDUCTIVITY NON-AQUEOUS ELECTROLYTE CREATES A DEVICE WITH CAPACITY FROM BOTH THE DOUBLE LAYER CAPACITANCE AND GALVANIC CONTRIBUTIONS. ENERGY DENSITIES GREATER THAN 500 J/# ARE EXPECTED AS WELL AS ULTRAFAST RESPONSE TIME. IMPACT SURVIVABLE BIPOLAR ELECTRODES ARE DESCRIBED FOR EVENTUAL USE IN 1500 V PILE.

ELECTRONIC DEVELOPMENT ASSOCS INC
1 WESTCLIFF DR
DIX HILLS, NY 11746
CONTRACT NUMBER:
LEONARD ZUCKERMAN
TITLE:
PULSE TO DIGITAL CONVERSION SYSTEM
TOPIC# 26 OFFICE: AEDC/DOT

SUBMITTED BY

ELECTRONIC DEVELOPMENT ASSOCIATES, EDA, ESTABLISHED IN 1982, WITH 25 YEARS PRODUCT DEVELOPMENT EXPERIENCE, NOTEWORTHY CONSULTANTS AND A FULLY EQUIPPED FACILITY, HAS FORMULATED A UNIQUE APPROACH FOR A REAL TIME, ONE STEP, ACCURATE, WIDE DYNAMIC RANGE AND MULTICHANNEL PULSE TO DIGITAL CONVERTER SYSTEM. THE EDA PULSE TO DIGITAL CONVERTER SHALL UTILIZE A SIMPLE METHOD FOR DETERMINING THE FREQUENCIES OF EACH OF 30 INPUT PULSE TRAIN CHANNELS. HOWEVER, THE UNIQUENESS OF THE EDA APPROACH OVER EXISTING INSTRUMENTATION TECHNOLOGY IS THAT THE EDA DIGITAL OUTPUT IS IN REAL TIME, WITH UP TO 200 MEASUREMENTS PER SECOND FOR EACH OF 30 PULSE DATA CHANNELS. LIKEWISE, EACH DATA OUTPUT IS ALSO UPDATED AT A RATE UP TO 200 TIMES PER SECOND. ALL OF THIS CAPABILITY CAN BE PACKAGED IN A SINGLE RACK MOUNTED INSTRUMENTATION ENCLOSURE UTILIZING STANDARD COMPONENTS AND CIRCUIT CARD TECHNIQUES. EDA PROPOSES TO DEMONSTRATE THIS CONCEPT BY DESIGNING AND BUILDING A FULLY EXPANDABLE TWO CHANNEL BREADBOARD MODEL THEN TESTING AND DEMONSTRATING ITS PERFORMANCE.

ELECTROSYNTHESIS CO INC
PO BOX 16
E AMHERST, NY 14051
CONTRACT NUMBER: F33615-87-C-2799
DR NORMAN L WEINBERG
TITLE:
CHEMICALLY MODIFIED CARBONS FOR LITHIUM BATTERIES
TOPIC# 126 OFFICE: AFWAL/PO

CARBON ELECTRODES ARE AN INTEGRAL COMPONENT OF HIGH ENERGY DENSITY Li/SOCl(2) AND Li/SO(2)Cl(2) PRIMARY BATTERY SYSTEMS. RATE CAPABILITY AND POLARIZATION BEHAVIOR OF THE ELECTRODE IS EXPECTED TO BE ENHANCED BY SPECIFIC PRETREATMENTS OF THE CARBON. FACTORS KNOWN TO INFLUENCE THE CARBON'S PERFORMANCE ARE SURFACE AREA, POROSITY AND PORE SIZE DISTRIBUTION, THERMAL AND ELECTRICAL CONDUCTIVITY, AND WETTABILITY BY THE OXYHALIDE AND ELECTROLYTE. THIS PROPOSAL ADDRESSES SPECIFIC CHEMICAL SURFACE TREATMENTS OF CARBONS WHICH ARE EXPECTED TO AFFECT THE RATE PERFORMANCE, SPECIFIC CAPACITY AND SHELF-LIFE OF THE BATTERY. THE GOAL IS A DELIVERABLE BATTERY CAPABLE OF PROVIDING OVER 400 WATT-HOURS/POUND OR 25 WATT HOURS/CUBIC INCH AT THE 100 HOUR RATE OR SLOWER DISCHARGES, AS WELL AS A SIGNIFICANT INCREASE IN STORAGE CAPABILITY.

SUBMITTED BY

ENERGY & ENVIRONMENT RESEARCH LABS
2378 MORSLAY RD
ALTADENA, CA 91001
CONTRACT NUMBER: F33615-87-C-2789
MOHAMMAD-ALI SADEGHI
TITLE:
CHEMICAL ANALYSES OF ADVANCED FUELS
TOPIC# 132 OFFICE: AFWAL/PO

A NEW SEPARATION SCHEME BASED ON AN INEXPENSIVE EQUIPMENT IS DEVELOPED TO IDENTIFY THE MAJOR CHEMICAL TYPES IN AVIATION HYDRO-CARBON FUELS. THIS EQUIPMENT CAN BE CALLED AS A CENTRIFUGAL, HIGH-PERFORMANCE, RADIAL, PREPARATIVE, GRADIENT DEVELOPED, THIN-LAYER CHROMATOGRAPHY. THE BEST AVAILABLE, STATE-OF-THE-ART SEPARATION SCHEMES WILL BE USED FOR COMPARISON. VERIFICATION WILL BE CARRIED OUT EITHER BY INTERNAL STANDARDS OR BY CAPILLARY, HIGH RESOLUTION, GAS CHROMATOGRAPH-MASS SPECTROMETRY ANALYSIS.

ENERGY COMPRESSION RESEARCH CORP
1110 CAMINO DEL MAR - STE C
DEL MAR, CA 92014
CONTRACT NUMBER: 87-C-0115
OVED ZUCKER
TITLE:
ENHANCED EFFICIENCY EXPLOSIVE GENERATORS
TOPIC# 15 OFFICE: AD/SAS

AIR FORCE REQUIREMENTS FOR SPACE POWER INSIST ON LOW WEIGHT, RELIABILITY, AND MINIMUM COLLATERAL DAMAGE. EXPLOSIVE GENERATORS (MCG'S) HAVE LONG SHELF LIFE AND RELIABILITY BUT THEIR POOR ENERGY CONVERSION EFFICIENCY RESULTS IN AN UNACCEPTABLE AMOUNT OF EXPLOSIVE WHICH AFFECTS BOTH THE WEIGHT AND THE COLLATERAL DAMAGE. A NOVEL DESIGN IS PROPOSED WHICH USES A SELF TAMPERED, DISTRIBUTED EXPLOSIVE AND CURRENT CARRYING CONDUCTORS AND WHICH YIELDS SUBSTANTIAL IM-PROVEMENTS IN EFFICIENCY AND WEIGHT. THE DESIGN ALSO PROVIDES QUASI SELF-CONTAINMENT. THE RESULTING COMPACTNESS IS EXPECTED TO ALLOW POWER PACKS ON A COMMON BUS. THESE PACKS CAN THEN BE OPERATED

SUBMITTED BY

SEQUENTIALLY AND THE DEBRIS EJECTED-HARMLESSLY IN A MOMENTUM BALANCED FASHION.

ENERGY SCIENCE LABS INC
PO BOX 85608
SAN DIEGO, CA 92138
CONTRACT NUMBER:
JOHN C OLDSON
TITLE:
IMPROVED EFFICIENCY ELECTRIC PROPULSION FOR ORBIT TRAN
MISSIONS
TOPIC# 192 OFFICE: AFRPL/TSTR

THIS PROJECT WILL INVESTIGATE METHODS FOR INCREASING THE EFFICIENCY OF ION ENGINES, SPECIFICALLY AROUND THE EXHAUST VELOCITY OF 20 km/s, WHICH IS NEAR THE OPTIMUM FOR TYPICAL LOW EARTH ORBIT TO GEO-STATIONARY ORBIT TRANSFER. CURRENTLY, NO FORM OF PROPULSION PERFORMS WELL IN THIS CRITICAL REGION. THIS PRESENTS A SERIOUS BARRIER TO LARGE SCALE USE OF ELECTRIC PROPULSION. WE HAVE IDENTIFIED SEVERAL POTENTIAL METHODS FOR EFFICIENTLY CREATING IONS, WHICH IS THE MAJOR PROBLEM WITH ACHIEVING ACCEPTABLE PERFORMANCE IN ION ENGINES IN THIS VELOCITY RANGE. NEW METAL IONS, HEAVY ORGANIC COMPOUNDS, AND METAL CLUSTERS HAVE BEEN IDENTIFIED AS PROPELLANTS WHICH MAY ACHIEVE THE DESIRED INCREASE IN EFFICIENCY. THEORETICAL ANALYSIS AND SOME EXPERIMENTAL WORK WILL BE DONE TO EXPLORE THE MERITS OF OUR PROPOSED PROPELLANTS. SUPPORTING WORK ON SYSTEMS STUDIES AND TRADES WILL ALSO BE CARRIED OUT.

ENERGY SCIENCE LABS INC
PO BOX 85608
SAN DIEGO, CA 92138
CONTRACT NUMBER: F33615-87-C-2795
ANDREW H CUTLER
TITLE:
CRACKED AMMONIA FOR HYPERSONIC PROPULSION
TOPIC# 133 OFFICE: AFWAL/PO

CRACKED AMMONIA (NITROGEN + HYDROGEN, 3H(2)+N(2)) HAS MANY

SUBMITTED BY

ADVANTAGES AS A HYPERSONIC PROPULSION FUEL. IT HAS GOOD HEAT SINK CAPACITY, AND A GOOD VOLUMETRIC HEATING VALUE COMPARED TO LIQUID HYDROGEN. IT ALSO HAS MANY OTHER CONVENIENT PROPERTIES COMPARED TO LIQUID HYDROGEN. WE PROPOSE TO STUDY THE SYSTEMS ADVANTAGES OF AMMONIA VS. HYDROGEN FUEL, THE HEAT TRANSFER AND (CATALYZED) CRACKING KINETICS APPLICABLE TO ITS USED AS A COOLANT, AND CERTAIN ASPECTS OF ITS BEHAVIOR AS A FUEL GAS FOR SUPERSONIC COMBUSTORS.

ENFITEK INC
549 BRYCE AVE
LOS ALAMOS, NM 87544
CONTRACT NUMBER:
ALBERT ENGELHARDT
TITLE:
A FLOWING AFTERGLOW SYSTEM FOR STUDYING MOLECULAR REAC
TOPIC# 185 OFFICE: AFRPL/TSTR

THE DESIGN AND CONSTRUCTION OF A FLOWING AFTERGLOW SYSTEM IS PROPOSED. THE DESIGN (PHASE I) WOULD MAKE EXTENSIVE USE OF PREVIOUS DESIGNS UP-DATED WITH MODERN ELECTRONICS AND MATERIALS. SOME NEW IDEAS ARE PRE-SENTED, SUCH AS THE USE OF LASER EXCITATION OF THE BUFFER GAS AND THE USE OF AN OMA FOR SPECTROSCOPIC ANALYSIS. A COMPLETELY MODULAR DE-SIGN IS PROPOSED TO ALLOW USE OF A LARGE NUMBER OF COMBINATIONS OF EXCITATION SOURCES, SECONDARY SPECIES SOURCES, FLOW TUBES OR FLOW-DRIFT TUBES. THE SYSTEM WOULD BE COMPUTER CONTROLLED AND DIGITAL DATA ACQUISITION WOULD BE USED. PROVISION IS MADE FOR SIMULTANEOUS SPECTROSCOPIC DETECTION AND MASS SPECTROMETRY ON THE REACTION PRO-DUCTS.

ENFITEK INC
549 BRYCE AVE
LOS ALAMOS, NM 87544
CONTRACT NUMBER: F29601-87-C-0037
ALBERT ENGELHARDT
TITLE:
PHASE CONJUGATE WAVEFRONT CORRECTION OF LASER TRANSMIS
THE ATMOSPHERE
TOPIC# 195 OFFICE: AFWL/PRC

SUBMITTED BY

FOR OPTICAL OR INFRARED LASER RADIATION TRANSMITTED THROUGH THE EARTH'S ATMOSPHERE, ONE CAN BUILD AN IMAGING SYSTEM IN WHICH NON-LINEAR OPTICAL PHASE CONJUGATION IS USED TO CORRECT FOR WAVEFRONT DEGRADATION INDUCED BY ATMOSPHERIC TURBULENCE. TWO TYPES OF SUCH SYSTEMS ARE POSSIBLE. THE SIMPLER IS DESIGNED FOR TWO-WAY TRANS-MISSION OF AN IMAGE, THE MORE DIFFICULT IS DESIGN FOR ONE-WAY TRANS-MISSION OF AN IMAGE. THE SUCCESSFUL OPERATION OF BOTH DEVICES DE-PENDS IN PART ON THE CHOICE OF CONJUGATE MATERIAL AND THE TYPE OF NONLINEAR INTERACTION EMPLOYED. THE EFFECTIVENESS OF THE ONE-WAY DE-VICE IS ALSO UNIQUELY DEPENDENT ON THE DESIGN OF CONVENTIONAL IMAGING OPTICS AND THE SPATIAL BANDWIDTH OF THE TRANSMITTED INFORMATION. THIS PROPOSAL ADDRESSES THE CHOICE OF CONJUGATOR MEDIUM FOR COMPEN-SATED TRANSMISSION OF IMAGES, THE APPROPRIATE LASER SOURCE, AND IMAGING OPTICS DESIGN. THE CONJUGATOR TYPE PROPOSED WILL BE ONE OF A NUMBER OF AVAILABLE INFRARED-PHOTOREFRACTIVE SEMICONDUCTORS, SUCH AS DOPED InP, GaAs, OR CdTe.

ENGINEERING & ECONOMICS RESEARCH INC
1801 ALEXANDER BELL DR - STE 400
RESTON, VA 22091
CONTRACT NUMBER:
GEORGE O HUSSEY
TITLE:
AIR SPACE MANAGEMENT
TOPIC# 33 OFFICE: ESD/XR

IN RECOGNITION OF THE GROWING SHORTFALL BETWEEN NEEDS AND ABILITIES TO PROVIDE A SAFE AND EFFICIENT AIR NAVIGATION AND AIR TRAFFIC CON-TROL SYSTEM, THE FEDERAL AVIATION ADMINISTRATION (FAA) IMPLEMENTED ITS LONG RANGE PLANNING NATIONAL AIRSPACE SYSTEM (NAS) PLAN. THE NAS PLAN CONTAINS A COLLECTION OF MODERNIZATION PROJECTS AFFECTING MOST ELEMENTS OF THE NAS AND POTENTIALLY HAVING SIGNIFICANT IMPCTS ON SYS-TEM USERS. AS A PRIMARY USER OF THE SYSTEM, AND ALSO A PROVIDER OF AIR TRAFFIC CONTROL SERVICES, THE MILITARY IS VITALLY INTERETED IN THE OPERATION AND THE PLANNING OF THE NAS. THE OBJECTIVES OF THIS PROJECT ARE TO SPECIFY (1) A MANAGEMENT STRUCTURE TO MEET IMMEDIATE AND FUTURE NAS PLAN INTERFACE REQUIREMENTS; AND (2) HOW THE MANAGE-MENT STRUCTURE WILL SERVE TO INCORPORATE THE KEY ISSUES OF NAS/DOD INTERFACE. CURRENT EFFORTS IN THIS AREA BY THE AIR FORCE AND OTHER

SUBMITTED BY

ELEMENTS OF DOD ARE SOMEWHAT FRAGMENTED AND MAY NOT ASSURE COVERAGE OF DEFENSE ISSUES IN LONG RANGE NAS PLANNING. THIS WORK WOULD BE THE FIRST STEP IN BRINGING THE CURRENT INDEPENDENT AND NON-SYSTEMATIC EFFORTS OF THE MILITARY SERVICES UNDER THE UMBRELLA OF A SYSTEM-ENGINEERED APPROACH TO LONG RANGE PLANNING OF DOD/FAA NAS MODERNIZATION AND ATC INTERFACE.

EOS TECHNOLOGIES INC
606 WILSHIRE BLVD - STE 700
SANTA MONICA, CA 90401
CONTRACT NUMBER: F29601-87-C-0035
WALTER WEBER
TITLE:
SPATIAL AND TEMPORAL BANDWIDTHS OF ONE WAY IMAGING SYS ON PHASE CONJUGATION
TOPIC# 195 OFFICE: AFWL/PRC

THE SPATIALLY LINEAR PROPERTY OF DIFFRACTION FROM HOLOGRAPHIC GRATING IS USED TO CHARACTERIZED ONE WAY IMAGE TRANSMISSION SYSTEMS BASED ON PHASE CONJUGATION. MODELS OF THE ATMOSPHERE AND DETECTOR CHARACTERISTICS ARE USED TO DETERMINE SUITABLE OPERATING WAVELENGTHS AND MATERIALS FOR MINIMUM ABSORPTION AND MAXIMUM DETECTABILITY. THE POSSIBILITY OF TRANSMITTING SIMULTANEOUS SPATIALLY AND TEMPORALLY ENCODED INFORMATION TO SATELLITES IS CONSIDERED.

EPITAXX INC
3490 U.S. RTE 1
PRINCETON, NJ 08 0
CONTRACT NUMBER: F33615-87-C-5292
DR V S BAN
TITLE:
INNOVATIVE GROWTH TECHNIQUE FOR INFRARED DETECTORS: AT EPITAXY
TOPIC# 91 OFFICE: AFWAL/ML

WE PROPOSE TO DEVELOP AN ATOMIC LAYER EPITAXY (ALE) TECHNIQUE WHEREBY THE CRYSTAL GROWTH OF SINGLE ATOMIC LAYERS WILL BE APPLIED TO THE FABRICATION OF INFRARED DETECTOR ARRAYS WITH EXTREMELY HIGH

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UNIFORMITY IN THE 0.5 TO 3 MICRON SPECTRAL RANGE. THE USE OF LAYER GROWTH ELIMINATES THICKNESS AND COMPOSITIONAL VARIATIONS ACROSS A WAFER. THUS NON-UNIFORMITIES DUE TO THERMAL GRADIENTS AND VAPOR DEPLETION ARE ELIMINATED SINCE CRYSTAL GROWTH WOULD DEPEND ON KINETIC FACTORS, RATHER THAN ON THERMODYNAMICS OR MASS TRANSPORT PHENOMENA. DETECTOR ARRAYS PRODUCED WOULD HAVE PERFORMANCE UNIFORMITIES FAR BETTER THAN ANYTHING PRESENTLY AVAILABLE AND MULTI-ELEMENT ARRAYS - POSSIBLY SEVERAL HUNDRED ELEMENTS -COULD BE MADE. OTHER DEVICE STRUCTURES SUCH AS QUANTUM WELLS AND STAIRCASE AVALANCHE PHOTODIODES, WOULD ALSO BE POSSIBLE WITH THIS THIN LAYER TECHNIQUE, PHASE I WOULD CONSIST OF BUILDING AN OPTIMIZED REACTOR SPECIFICALLY DESIGNED FOR ALE AND MAKING HIGH PERFORMANCE DETECTOR ARRAYS. TRANSMISSION ELECTRON MICROSCOPE MEASUREMENTS OF ATOMIC LAYER THICKNESS WILL BE PERFORMED AT THE MATERIALS SCIENCE CENTER OF THE UNIVERSITY OF VIRGINIA.

EPSILON LAMBDA ELECTRONICS CORP
427 STEVENS ST
GENEVA, IL 60134
CONTRACT NUMBER: 87-C-0340
KENNETH WOOD
TITLE:
MICROSTRIP PHASED ARRAY MILLIMETER WAVE RADAR ANTENNA
TOPIC# 1 OFFICE: AFATL/SAS

THE OBJECTIVE OF THE PROJECT IS TO DESIGN AND PRODUCE A LOW COST PLANAR ARRAY OPERATING AT 94 GHZ WHICH WOULD USE A COMBINATION OF Z-CUT QUARTZ MICROSTRIP FOR THE RADIATING ELEMENTS AND LOW LOSS INSULAR GUIDE LINES FOR THE FEED NETWORK. THE INITIAL PHASE I WORK WILL CONCENTRATE ON THE ANALYSIS OF THE PROXIMITY COUPLING BETWEEN THE INSULAR GUIDE FEED LINE AND THE MICROSTRIP PATCHES. THE FIRST PHASE OF THE WORK WILL ALSO ADDRESS THE ISSUE OF THE PHASE SHIFTER IN THE INSULAR GUIDE FEED LINE.

EPSILON LAMBDA ELECTRONICS INC
427 STEVENS ST
GENEVA, IL 60134
CONTRACT NUMBER:
DR PETER P TOULIOS
TITLE:
ACCELERATION HARDENED 84 GHz TRANSMITTER
TOPIC# 213 OFFICE: BMO/MYSC

SUBMITTED BY

THE PROJECT WILL DEVELOP AND TEST A HARDENED GUNN VOLTAGE CONTROLLED OSCILLATOR (VCO) CAPABLE OF SURVIVAL TO A LEVEL OF AT LEAST 50,000 G WITH A GOAL OF 100,000 G. SUCH AN OSCILLATOR HAS POTENTIAL APPLICATIONS TO PROJECTILES OR MISSILES WHICH EXPERIENCE VERY HIGH SHOCK DURING FIRING (LAUNCH). THE DESIGN INVOLVES USE OF A RIGID CHOKE STRUCTURE WHICH PREVENTS TOP LOADING ON THE GUNN AND VARACTOR DIODES DURING SHOCK STRESS. THE PROPOSED PROGRAM PROVIDES FOR STUDY OF TWO DIFFERENT VCO CONFIGURATIONS, FABRICATIONS, LABORATORY AND SHOCK TESTING, DESIGN AND FABRICATION ITERATION, RETESTING AND REPORTING OF RESULTS.

EXFLUOR RESEARCH CORP
PO BOX 7807
AUSTIN, TX 78713
CONTRACT NUMBER: F33615-87-C-5307
DR THOMAS R BIERSCHENK
TITLE:
THE PREPARATION OF NEW PERFLUOROPOLYETHER FLUIDS EXHIB EXCELLENT OXIDATIVE STABILITY
TOPIC# 95 OFFICE: AFWAL/ML

THE GOAL OF THIS RESEACH PROGRAM IS TO BETTER UNDERSTAND THE RELATIONSHIP BETWEEN OXIDATIVE STABILITY AND STRUCTURE AS IT RELATES TO PERFLUOROPOLYETHERS. WE INTEND TO USE DIRECT FLUORINATION TECHNOLOGY TO PRODUCE SEVERAL NEW PERFLUOROPOLYETHER FLUIDES WHICH CONTAIN UNIQUE ARRANGEMENTS OF CARBON AND OXYGEN IN THE BACKBONE OF THE POLYMER AS WELL AS UNUSUAL PENDANT GROUPS. THE DIRECT FLUORINATION PROCESS INVOLVES THE SELECTION OF A HYDROCARBON WITH THE PROPER STRUCTURE WHICH IS CONVERTED TO A FLUOROCARBON BY A CONTROLLED REACTION WITH ELEMENTAL FLUORINE. SINCE THE STARTING MATERIALS ARE HYDROCARBONS, NUMEROUS STRUCTURES CAN BE MADE DUE TO THE WIDE VARIETY OF MONOMERS AND SYNTHETIC TECHNIQUES AVAILABLE. IN CONTRAST, THE SYNTHESIS OF FLUOROCARBON POLYMERS FROM FLUOROCARBON MONOMERS IS COSTLY AND THE TYPES OF REACTIONS THAT CAN BE CARRIED OUT ARE EXTREMELY LIMITED. THE PERFLUOROPOLYETHERS PRODUCED WILL HAVE A VARIETY OF USES IN ENVIRONMENTS WHERE EXTREME STABILITY, VERY LOW VAPOR PRESSURE, LOW ACUATE TOXICITY, HIGH LUBRICITY AND VERY LOW POUR POINTS ARE REQUIRED.

EXPERT-EASE SYSTEMS INC
1301 SHOREWAY RD - STE 420
BELMONT, CA 94002
CONTRACT NUMBER: F33615-87-C-5311
BJORN FROGNER
TITLE:
DEVELOPMENT OF A KNOWLEDGE-BASED INTELLIGENT TUTORING
TOPIC# 83 OFFICE: AMD/RDO

SUBMITTED BY

THIS PROPOSAL ADDRESSES THE DEVELOPMENT OF AN INTELLIGENT TUTORING SYSTEM (ITS) TO TRAIN AIR FORCE PERSONNEL. EXPERT-EASE SYSTEMS (EES) HAS DEVELOPED AND DEMONSTRATED A SUCCESSFUL COMPUTER-BASED INSTRUCTION TECHNIQUE CALLED OPTIMALLY ADAPTIVE LEARNING (OAL). OAL COMBINES SEVERAL TECHNOLOGIES: OPTIMIZATION THEORY, EDUCATIONAL MODELING, AND HUMAN PSYCHOLOGY. THE OAL APPROACH UTILIZED ADVANCED OPTIMIZATION THEORY TO DETERMINE "PATHS" THROUGH THE EDUCATIONAL MATERIAL PRESENTED TO STUDENTS. BASED UPON AN INDIVIDUAL STUDENT'S NEEDS AND CAPABILITIES, THE OAL PROGRAM AUTOMATICALLY TAILORS A SPECIFIC SERIES OF COURSE MATERIAL FOR PRESENTATION TO THE STUDENT. IN THIS PROPOSAL, EES PRESENTS A PLAN TO COMBINE ITS EXISTING OAL APPROACH WITH A KNOWLEDGE-BASED EXPERT SYSTEM TO PRODUCE A PRACTICAL ITS FOR A SPECIFIC AIR FORCE APPLICATION. ITS PROGRAMS WILL RESULT IN: (1) REDUCED LEARNING TIMES, (2) ENHANCED LEARNING LEVELS, AND (3) MORE HIGHLY MOTIVATED STUDENTS.

EXPERT-EASE SYSTEMS INC
1301 SHOREWAY RD
BELMONT, CA 94002
CONTRACT NUMBER:
BJORN FROGNER
TITLE:
DEVELOPMENT OF A USER-FRIENDLY SOFTWARE ENVIRONMENT FO
APPLICATION
TOPIC# 90 OFFICE: AMD/RDO

THIS PROJECT WILL DEMONSTRATE HOW CURRENT DEVELOPMENTS FOR RAM APPLICATIONS FOR THE POWER PLANT INDUSTRY CAN BE ADAPTED TO ALSO INCLUDE THE NEEDS OF THE UNIFIED LIFE CYCLE ENGINEERING PROGRAM INITIATED BY THE AIR FORCE. A RECENTLY DEVELOPED USER-FRIENDLY WORKSTATION SOFTWARE ENVIRONMENT IS BEING USED AS THE STARTING POINT. THIS SOFTWARE IS CURRENTLY BEING AUGMENTED BY ARTIFICIAL INTELLIGENCE (AI) TECHNIQUES IN TWO MAJOR AREAS TO FURTHER EXPAND THE BOUNDARY OF USER-FRIENDLINESS FOR RAM ANALYSIS: a) A MENU-BASED NATURAL LANGUAGE APPROACH TO SIMPLIFY THE ACCESS TO DISTRIBUTED AND HETEROGENOUS DATA BASES AND b) AN EXPERT SYSTEM TO PERFORM CONSISTENCY CHECKING AND MODELING TRANSFORMATIONS TO INCORPORATE EXPERIENTIAL KNOWLEDGE INVOLVED IN RAM ANALYSIS.

EXTREL CORP
PO BOX 11512 - 240 ALPHA DR
PITTSBURGH, PA 15238
CONTRACT NUMBER:
WADE L FITE
TITLE:
FLOW AFTERGLOW DESIGN
TOPIC# 185 OFFICE: AFRPL/TSTR

SUBMITTED BY

THIS PROPOSAL IS FOR THE CONSTRUCTION OF AN ADVANCED FLOWING AFTERGLOW APPARATUS WITH SUFFICIENT PUMPING SPEED TO HANDLE BOTH NEUTRAL-NEUTRAL AND ION-NEUTRAL REACTION RATE COEFFICIENT MEASUREMENTS. THREE NEUTRAL-NEUTRAL FLOW TUBES OF DIFFERENT DIAMETERS ARE PROVIDED TO BE ABLE TO ASSESS WALL EFFECTS. ONE GENERAL PURPOSE ION-MOLECULE FLOW TUBE IS PROVIDED. THE ION DETECTOR IS A TRIPLE QUADRUPOLE TANDEM MASS SPECTROMETER WHICH ALLOWS ABSOLUTE DETERMINATION OF THE CHEMICAL NATURE OF THE IONS OBSERVED. IN THE NEUTRAL-NEUTRAL EXPERIMENTS THE SAMPLE IS PRESENTED TO THE MS/MS IONIZER AS A MODULATED MOLECULAR BEAM TO DISTINGUISH IONS FORMED FROM MOLECULES IN THE BEAM FROM THOSE IN THE RESIDUAL GAS IN THE VACUUM CHAMBER. OPTICAL WINDOWS ALONG THE LENGTHS OF THE FLOW TUBES PERMIT DETECTION OF REACTANTS AND PRODUCTS BY SPECTROSCOPIC MEANS INCLUDING LASER ABW SORPTION AND FLUORESCENCE. THE INSTRUMENT IS HARDENED TO ALLOW ITS USE WITH CORROSIVE GASES. A GAS HANDLING SYSTEM IS PROVIDED TO ALLOW PRECISE MEASUREMENTS OF GAS FLOWS OVER THE WIDE RANGE REQUIRED FOR BOTH ION-NEUTRAL AND NEUTRAL-NEUTRAL REACTION STUDIES. AN IBM-PC BASED DATA SYSTEM IS PROVIDED.

FAIL-SAFE TECHNOLOGY CORP
5757 W CENTURY BLVD - STE 645
LOS ANGELES, CA 90045
CONTRACT NUMBER:
DR MICAHEL W SIEVERS
TITLE:
FAULT-TOLERANT COMPUTER STUDY FOR SAFETY-CRITICAL SYST
TOPIC# 205 OFFICE: BMO/MYSC

AS A MINIMUM, NUCLEAR SAFETY CROSS-CHECK ANALYSIS (NCCCA) REQUIRES POSITIVE MEASURES TO PREVENT WEAPON YIELDS DUE TO ACCIDENTS OR INCIDENTS; PREVENT DELIBERATE ARMING, LAUNCHING, FIRING, OR RELEASING WEAPONS EXCEPT UNDER EMERGENCY WAR ORDERS FROM COMPETENT AUTHORITY; PREVENT INADVERTENT ARMING, LAUNCHING, OR RELEASING OF NUCLEAR WEAPONS; AND ENSURE ADEQUATE SECURITY OF NUCLEAR WEAPONS. WHEN COMPUTERS ARE USED IN SAFETY-CRITICAL APPLICATIONS IT BECOMES NECESSARY TO ENSURE THAT ALL CREDIBLE FAULTS DO NOT INVALIDATE THE SAFETY DESIGN. THE USE OF REDUNDANT CIRCUITRY, IF PROPERLY IMPLEMENTED, WILL ENABLE THE USE OF COMPUTERS WHERE ULTRA HIGH SAFETY AND RELIABILITY IS NEEDED. FAIL-SAFE TECHNOLOGY PROPOSES A SIX-MONTH STUDY THAT WILL

SUBMITTED BY

ESTABLISH DESIGN BOUNDARIES AND OPTIONS FOR IMPLEMENTING SAFETY-CRITICAL SYSTEMS.

FAILURE ANALYSIS ASSOCS
2225 E BAYSHORE RD
PALO ALTO, CA 94303
CONTRACT NUMBER: F33615-87-C-3232
JERRELL M THOMAS
TITLE:
FINITE ELEMENT MODELS FOR THE SUPPORTABILITY OF UNITED FORCE (USAF) AIRCRAFT STRUCTURES
TOPIC# 111 OFFICE: AFWAL/FI

THE PROPOSED PROJECT WILL DETERMINE THE FEASIBILITY OF USING A CENTRALIZED FUNCTION FOR FINITE ELEMENT MODELS OF USAF AIRCRAFT. THIS OBJECTIVE WILL BE ACHIEVED THROUGH CHARACTERIZATION OF FINITE ELEMENT MODEL USAGE, DEVELOPMENT AND COMPARISON OF APPROACHES TO MODEL COMMONALITY, AND CREATION AND COMPARISON OF CENTRALIZED FUNCTION CONCEPTS. THE KEY TECHNICAL ISSUES TO BE ADDRESSED IN APPROACHES TO MODEL COMMONALITY ARE: (1) HOW TO ESTABLISH COMMONALITY BETWEEN COARSE AND FINE MESH MODELS. (2) HOW TO TRANSFER DATA BETWEEN MODELS USING DIFFERENT FINITE ELEMENT CODES. THE KEY ISSUE TO BE ADDRESED IN CREATING A CENTRALIZED FUNCTION IS WHAT WORK WOULD BE DONE WITHIN THE CENTRALIZED FUNCTION AND WHAT WOULD BE RETAINED WITHIN THE EXISTING DISPERSED TECHNICAL SPECIALITY FUNCTIONS.

FAILURE ANALYSIS ASSOCS
PO BOX 51470 - 2225 E BAYSHORE RD
PALO ALTO, CA 94303
CONTRACT NUMBER:
MICHAEL A BURKE
TITLE:
A NONLINEAR VISCOELASTIC CONSTITUTIVE MODEL FOR SOILD
TOPIC# 225 OFFICE: BMO/MYSC

FAILURE ANALYSIS ASSOCIATES (FaAA) PROPOSES TO EVALUATE A NONLINEAR VISCOELASTIC CONSTITUTIVE LAW FOR MODELING THE RESPONSE OF SOLID ROCKET PROPELLANT. THIS CONSTITUTIVE LAW, WHICH IS BASED ON MODIFIED

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COLEMAN-NOLL MODEL, IS KNOWN AS THE BURKE MODEL, AFTER ITS DEVELOPER, DR MICHAEL A BURKE OF FaAA. THE BURKE MODEL HAS BEEN SUCCESSFULLY EMPLOYED TO ACCURATELY PREDICT THE BEHAVIOR OF POLYMERS AND RUBBER MATERIALS, BUT HAS NOT BEEN APPLIED TO PROPELLANT. IN THIS PROJECT, ALGORITHMS WILL BE DEVELOPED FOR THE BURKE MODEL AND FOR THE ANCILLARY CODE REQUIRED TO DERIVE MODEL COEFFICIENTS FROM TEST DATA. PROPELLANT BEHAVIOR PREDICTED USING THESE ALGORITHMS WILL BE COMPARED WITH EXISTING PROPELLANT TEST DATA TO PROVIDE A MEASURE OF THE ACCURACY AND APPLICABILITY OF THE BURKE MODEL. IF SUCCESS IS ACHIEVED, THE BURKE MODEL COULD THEN BE EXTENDED AND INCORPORATED INTO A FINITE ELEMENT CODE FOR USE IN THE ANALYSIS OF SOLID ROCKET MOTORS.

FIRE RESEARCH CORP
16 SOUTHERN BLVD
NESCONSET, NY 11767
CONTRACT NUMBER:
NEOCLES ATHANASIADES
TITLE:
INCREASE THROW RANGE OF GASEOUS FIRE SUPPRESSION AGENT
TOPIC# 71 OFFICE: AFESC/RDXP

FIRE RESEARCH FEELS WE CAN INCREASE THE THROW RANGE OF HALON FIRE SUPPRESSION AGENTS BY SIMPLY COOLING IT TO A VERY LOW TEMPERATURE SO THAT IT DOES NOT BECOME A GAS BUT REMAINS IN A LIQUID STATE FOR AS LONG AS POSSIBLE. WE PROPOSE TO DO THIS BY USING THE COOLING POWER OF CO2 GOING FROM A LIQUID TO A GASEOUS STATE. IT HAS TREMENDOUS HEAT ABSORPTION CAPABILITIES AND WILL COOL THE HALON. IN ADDITION, IT WILL ACT AS AN INDEPENDENT FIREFIGHTING AGENT. THE HALON WILL NOT TOUCH THE CO2 UNTIL IT EXITS THE NOZZLE. THEY WILL NOT REACT WITH EACH OTHER.

FLAM & RUSSELL INC
PO BOX 444
HORSHAM, PA 19044
CONTRACT NUMBER:
L R BURGESS
TITLE:
NEAR FIELD SCANNING ON AN EXTERNAL SPHERE
TOPIC# 41 OFFICE: RADC/XPX

SUBMITTED BY

NEAR-FIELD ANTENNA MEASUREMENT SYSTEMS PROVIDE A POWERFUL, AND OFTEN THE ONLY FEASIBLE, METHOD OF DETERMINING THE FAR FIELD OF VERY LARGE APERTURE ANTENNAS OR OF SPACEBORNE ANTENNAS. EXISTING NEAR-FIELD MEASUREMENT FACILITIES REQUIRE PRECISE POSITIONING SYSTEMS FOR THE PROBE ANTENNA AND AS A CONSEQUENCE ARE EXPENSIVE AND RISKY. A POTENTIAL IMPRO''EMENT TO NEAR-FIELD MEASUREMENT IMPLEMENTATION IS A SYSTEM THAT USES A FOUCAULT PENDULUM AS THE SCANNER WITH A PROBE AT THE BOTTOM OF THE PENDULUM'S ARM SWINGING ABOVE THE ANTENNA UNDER TEST (AUT). WE PROPOSE TO DESIGN A NEAR-FIELD MEASUREMENT SYSTEM BUILT AROUND THIS CONCEPT, AND THIS PROPOSAL CONTAINS OUR APPROACH TO SUCH A DESIGN. WE PRESENT THE THEORY OF SCANNING OVER ARBITRARY EXTERNAL SPHERES AS WELL AS SAMPLING CRITERIA, FILTERING, AND OTHER NECESSARY SIGNAL PROCESSING TECHNIQUES APPLIED TO THE MEASURED NEAR-FIELD DATA. WE ALSO CONSIDER THE SOURCES OF ERRORS PRODUCED IN SUCH A MEASUREMENT SYSTEM AS WELL AS PRESENT THE EQUATIONS DESCRIBING THEIR FUNCTIONAL BEHAVIOR. ADDITIONALLY, WE ADDRESS SUCH ISSUES AS BANDWIDTH, DYNAMIC RANGE, AND A/D CONVERSION SPEED. IN ORDER TO TEST THE PHYSICAL CREDIBILITY OF THE PENDULUM-SUPPORTED PROBE MEASUREMENT SYSTEM, WE HAVE MADE SOME PRELIMINARY ESTIMATES OF PENDULUM SIZE FOR LARGE ANTENNAS OPERATING AT X-BAND. FINALLY, WE PRESENT A BLOCK DIAGRAM FOR A PROPOSED NEAR-FIELD MEASUREMENT SYSTEM.

FLOW RESEARCH CO
21414 - 68TH AVE S
KENT, WA 98032
CONTRACT NUMBER: F33615-87-C-2782
DR SURESH MENON
TITLE:
MIXING ENHANCEMENT NEAR SCRAMJET FLAME HOLDERS
TOPIC# 134 OFFICE: AFWAL/PO

THE UNSTEADY FLOW PHENOMENA AROUND REALISTIC SCRAMJET FLAME HOLDERS WILL BE STUDIED USING AN EFFICIENT TIME-ACCURATE NUMERICAL SCHEME. NUMERICAL SIMULATION OF A SUBSONIC RAMJET HAS SHOWN AN INTERACTION BETWEEN THE LARGE-SCALE VORTICES AND ACOUSTIC WAVES AT A CHARACTERISTIC NONACOUSTIC EIGENFREQUENCY. IN SUPERSONIC RAMJETS, ACOUSTIC WAVES WILL PROPAGATE UPSTREAM ONLY THROUGH THE SUBSONIC RECIRCULATION ZONE AND MAY INTERACT WITH THE SEPARATED SHEAR LAYER, RESULTING IN SIMILAR OSCILLATIONS. THIS ASPECT OF FEEDBACK MECHANISMS WILL BE

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STUDIED IN DETAIL AS A FUNCTION OF MACH NUMBER IN THE PROPOSED STUDY. THE EXISTENCE OF THIS TYPE OF FEEDBACK HAS IMPORTANT IMPLICATIONS FOR ENHANCING MIXING AND HENCE INCREASING COMBUSTION EFFICIENCY. SPECTRAL ANALYSIS AND CROSS CORRELATION OF THE TIME VARIATION OF THE PRESSURE AND VORTICITY FLUCTUATIONS AT VARIOUS LOCATIONS WILL BE EMPLOYED TO IDENTIFY THE CHARACTERISTIC FREQUENCY OF OSCILLATION AND WAVE PROPAGATION. THE PROPOSED STUDY WILL DETERMINE WHETHER COUPLING BETWEEN ACOUSTICS AND VORTEX MOTION CAN BE SUSTAINED IN THE VICINITY OF A SCRAMJET FLAME HOLDER AND HOW IT IS AFFECTED BY THE MACH NUMBER OF THE FLOW.

FLOW RESEARCH CO
21414 - 68TH AVE S
KENT, WA 98032
CONTRACT NUMBER: F33615-87-C-2790
DR PEYMAN GIVI
TITLE:
VORTEX-SCALAR ELEMENT CALCULATIONS OF A CONFINED CHEMI REACTING MIXING LAYER
TOPIC# 134 OFFICE: AFWAL/PO

THIS PROPOSAL DESCRIBES A COMPUTATIONAL EFFORT, BASED ON A LAGRANGIAN "VORTEX-SCALAR ELEMENT" METHOD, FOR THE SIMULATION OF A TIME-DEPENDENT MIXING LAYER UNDER BOTH NONREACTING AND NONPREMIXED REACTING CONDITIONS. THE METHOD REPRESENTS VORTICITY AND SCALARS (CONCENTRATIONS AND TEMPERATURE) BY "VORTEX" AND "SCALAR" ELEMENTS, RESPECTIVELY, AND HAS THE ADVANTAGE THAT HIGH REYNOLDS NUMBER FLOWS CAN BE SIMULATED ACCURATELY. IN PHASE I, SIMULATIONS WILL BE PERFORMED FOR A TWO-DIMENSIONAL, SPATIALLY DEVELOPING MIXING LAYER. THE FOLLOWING PHYSICAL PHENOMENA WILL BE CONSIDERED: (1) THE ASYMMETRIC MIXING MECHANISM IN A NONREACTING MIXING LAYER; (2) INTERACTIONS BETWEEN LARGE COHERENT STRUCTURES AND FINITE RATE CHEMICAL REACTIONS IN A DILUTE REACTING MIXING LAYER; AND (3) THE NONEQUILIBRIUM EFFECTS OF VARIABLE-TEMPERATURE CHEMICAL REACTIONS ON THE IGNITION AND EXTINCTION CHARACTERISTICS OF A DIFFUSION FLAME. IN PHASE II, A NEW SCHEME WILL BE IMPLEMENTED TO SOLVE THE SCALAR TRANSPORT EQUATIONS, AND THE THREE-DIMENSIONAL PROBLEM WILL BE STUDIED. THE SCALAR ELEMENTS WILL BE REPLACED BY "SCALAR GRADIENT ELEMENTS" FOR THE SOLUTION OF THE SCALAR TRANSPORT EQUATIONS. THIS WILL IMPROVE THE

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EFFICIENCY AND THE SPATIAL RESOLUTION OF THE NUMERICAL PROCEDURES SUBSTANTIALLY. NEXT, THREE-DIMENSIONAL CALCULATIONS BY TRACING "VORTEX FILAMENTS" WILL BE PERFORMED. SUCH SIMULATIONS WILL EXHIBIT THE EFFECTS OF THREE-DIMENSIONAL TURBULENCE MOTION ON THE CHEMICAL REACTIONS AND ALSO WILL DETERMINE THE RANGE OF VALIDITY OF RECENTLY DEVELOPED ADVANCED TURBULENCE MODELS FOR THE PREDICTION OF SUCH FLOWS.

FLOW RESEARCH CO
21414 - 68TH AVE S
KENT, WA 98032
CONTRACT NUMBER:
JAMES L DOYLE JR
TITLE:
BALLISTIC RANGE/TRACK ALIGNMENT DIAGNOSTICS
TOPIC# 25 OFFICE: AEDC/DOT

THIS PROPOSAL ADDRESSES THE DEVELOPMENT OF AN AUTOMATED ALIGNMENT MEASURING SYSTEM FOR THE HYPERVELOCITY RANGE/TRACK G FACILITY, LOCATED AT ARNOLD ENGINEERING DEVELOPMENT CENTER. THE OBJECTIVES OF THIS RESEARCH AND DEVELOPMENT EFFORT ARE TO EVALUATE METHODS FOR DEVELOPING A SYSTEM THAT CAN RAPIDLY AND COST-EFFECTIVELY INSPECT THE TEST TRACK. THIS WILL REQUIRE AN IN-DEPTH UNDERSTANDING OF THE ENVIRONMENTAL RESTRICTIONS AND SPECIFIC EQUIPMENT REQUIREMENTS. AT THE CONCLUSION OF THIS EFFORT, A CONCEPTUAL DESIGN WILL BE GENERATED THAT WILL FORM THE BASIS OF A PHASE II PROGRAM TO DEVELOP AN OPERATIONAL PROTOTYPE.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: 87-C-0297
JOSEPH S BOYCE
TITLE:
LIGHTWEIGHT NON-METALLIC HIGH PERFORMANCE GUN BARRELS
TOPIC# 10 OFFICE: AFATL/MNG

THE LIMITATIONS OF STEEL (WEIGHT, EROSION, CORROSION, WEAR, AND

SUBMITTED BY

DEPENDENCE ON STRATEGIC ALLOYING ELEMENTS) HAVE INHIBITED THE DEVELOPMENT OF EXTREMELY HIGH PERFORMANCE MILITARY GUN BARRELS. OF THE MANY METALLIC AND NONMETALLIC ALTERNATIVES TO STEEL, ONLY CERAMICS ENJOY INTRINSIC IMMUNITY TO ALL FIVE LIMITATIONS. HOWEVER, CONVENTIONAL (MONOLITHIC) CERAMICS LACK THE TOUGHNESS REQUIRED OF A GUN BARREL MATERIAL. THE PROPOSED PHASE I EFFORT INVOLVES THE DESIGN, FABRICATION, AND TESTING OF CERAMIC BARREL LINERS TOUGHENED BY THE INCLUSION OF RANDOMLY ORIENTED "WHISKERS." THE LINERS WILL BE FURTHER REINFORCED BY EXTERNAL WRAPPINGS OF CONTINUOUS FIBERS IN A SUITABLE MATRIX. MEANS FOR EXTERNAL COOLING WILL BE DEVELOPED. THE OBJECTIVE IS TO CREATE A GUN BARREL MUCH LIGHTER THAN, AND POTENTIALLY SUPERIOR TO, STEEL BARRELS, AND WHICH CAN WITHSTAND HIGHER RATES OF FIRE SUSTAINED PERIODS.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: FQ8671-8701501
PAUL J MARINACCIO
TITLE:
FTIR SENSING OF MOLECULAR ORIENTATION FOR NON-LINEAR O
TOPIC# 241 OFFICE: AFOSR/XOT

THE APPLICATION OF ARTIFICIAL INTELLIGENCE TECHNIQUES TO THE REAL TIME CONTROL OF POLYMER PROCESSING OFFERS POTENTIAL FOR GENERATING MATERIALS WITH IMPROVED ENGINEERING PROPERTIES. FOSTER-MILLER PLANS TO DEVELOP METHODS FOR EXPERT SYSTEM CONTROL OF THE PROCESSING OF LIQUID CRYSTAL POLYMERS. BECAUSE OF THE IMPORTANCE OF MOLECULAR ORIENTATION IN CONTROLLING THE PHYSICAL AND OPTICAL PROPERTIES OF THESE MATERIALS IT IS FELT THAT REAL TIME CONTROL OF MOLECULAR ORIENTATION WILL BE NECESSARY IN ORDER TO FULLY EXPLOIT THE POTENTIAL OF THESE MATERIALS IN AIRCRAFT STRUCTURES, NONLINEAR OPTICAL DEVICES, AND ELECTRONICS APPLICATIONS. A FIRST STEP IN GENERATING THIS CONTROL IS THE DEVELOPMENT OF SENSOR DEVICES FOR MOLECULAR ORIENTATION. WE ARE PROPOSING IN THIS SBIR TO EVALUATE THE POTENTIAL OF POLARIZED FTIR FOR DETERMINING THE ORIENTATION IN LIQUID CRYSTALLINE POLYMER FILMS. THIS WILL LEAD TO THE DEVELOPMENT OF A NEW INSTRUMENTATION FOR DETERMINING AND CONTROLLING MOLECULAR ORDER IN REAL TIME FOR IMPROVED PROCESSING.

SUBMITTED BY

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: F29601-87-C-0041
WAYNE S HILL
TITLE:
THE EFFECTS OF MICROGRAVITY ON TWO-PHASE FLOWS
TOPIC# 200 OFFICE: AFWL/PRC

TWO-PHASE FLOWS WILL BE EMPLOYED IN MANY OF THE POWER GENERATION AND THERMAL MANAGEMENT SYSTEMS CURRENTLY UNDER DEVELOPMENT OR PROPOSED FOR FUTURE APPLICATION IN SPACE. WHILE THE PHENOMENA OCCURRING IN TWO-PHASE FLOW HAVE BEEN STUDIED EXTENSIVELY FOR EARTH-BOUND SYSTEMS, RELATIVELY LITTLE IS KNOWN ABOUT THE EFFECTS OF MICROGRAVITY ON TWO-PHASE FLOWS. AN ORGANIZED RESEARCH EFFORT IS NEEDED TO PERMIT THE DESIGN OF TWO-PHASE FLOW SYSTEMS FOR USE IN MICROGRAVITY. IN THE PHASE I EFFORT OF THE PROPOSED PROGRAM, A THOROUGH LITERATURE SURVEY WILL BE PERFORMED TO ASSESS THE CURRENT LEVEL OF UNDERSTANDING OF TWO-PHASE FLOWS IN MICROGRAVITY AS COMPARED TO THAT FOR TWO-PHASE FLOWS FOR EARTH-BASED SYSTEMS. THIS ASSESSMENT WILL BE SUPPLEMENTED BY ANALYSIS OF RESULTS ALREADY OBTAINED FOR EARTH-BOUND SYSTEMS TO DEVELOP A DETAILED EXPERIMENTAL PROGRAM PLAN. THIS TEST PLAN WILL INCLUDE EXPERIMENTS, TO BE PERFORMED IN FUTURE CONTRACT PHASES, DESIGNED TO ADVANCE THE STATE-OF-THE-ART FOR TWO-PHASE FLOWS IN MICROGRAVITY TO A LEVEL COMPARABLE TO THAT FOR TWO-PHASE FLOWS FOR EARTH-BOUND SYSTEMS.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: F33615-87-C-5280
MARK A DRUY
TITLE:
ORDERED POLYMERS FOR NONLINEAR OPTICAL APPLICATIONS
TOPIC# 98 OFFICE: AFWAL/ML

NONLINEAR OPTICS (NLO) IS INCREASINGLY IMPORTANT FOR A VARIETY OF

SUBMITTED BY

MILITARY AND COMMERCIAL NEEDS RANGING FROM NEW TYPES OF LASER WEAPONS TO FIBER OPTIC COMMUNICATIONS NETWORKS. RAPID ADVANCES IN OPTICAL PHASE CONFIGURATION, OPTICAL SWITCHING AND LOGIC HAVE DEMONSTRATED THE ENORMOUS POTENTIAL FOR PRACTICAL APPLICATIONS WITH CONCURRENT FAST-PACED MATERIALS DEVELOPMENT. A NEW CLASS OF ORGANIC MATERIALS CALLED ORDERED POLYMERS HAVE THE EXCELLENT INTRINSIC PROPERTIES AND TAILORABILITY TO MEET THE REQUIREMENTS OF A WIDE RANGE OF NONLINEAR OPTICAL DEVICES. THE PROPOSED PHASE I PROGRAM IS A MULTIDISCIPLINARY EFFORT TO TARGET KEY APPLICATIONS AND MATERIAL AND PROCESSING REQUIREMENTS FOR ORDERED POLYMERS. AS SUCH, THE PROGRAM WILL PROVIDE THE APPLICATIONS DEVELOPMENT NEEDED FOR THE TOTALLY NEW FIELD OF NLO DEVICES FROM ORGANIC POLYMERIC MATERIALS. THE RESULTS OF THE PHASE I PROGRAM WILL BE USED TO DIRECT MATERIAL AND PROCESS IMPROVEMENT AND BREADBOARD TESTING IN PHASE II.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: F33615-87-C-5289
JAMES RACICH
TITLE:
POLYPHOSPHORIC ACID SOLVATED BLENDS AND MOLECULAR COMP
TOPIC# 98 OFFICE: AFWAL/ML

LIMITATIONS ON THE UTILITY OF ORDERED POLYMERS IN AIRCRAFT AND AEROSPACE APPLICATIONS MAY BE OVERCOME THROUGH INCORPORATION OF COILED-CHAIN POLYMERS INTO ROD-LIKE POLYMER NETWORKS. THE PROPOSED PROGRAM WILL EVALUATE A NOVEL APPROACH FOR PROCESSING MOLECULAR COMPOSITES AND TWO-POLYMER BLENDS, BASED ON THE USE OF POLYPHOSPHORIC ACID AS SOLVENT. HIGH CONCENTRATION BLENDS AND LOWER CONCENTRATION BLENDS WILL BE PREPARED, BIAXIAL FILMS GENERATED, AND PROPERTIES DETERMINED.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: F33615-87-C3240
TED E KIRCHNER
TITLE:
AUTOMATED FATIGUE CRACK GROWTH MEASUREMENT
TOPIC# 110 OFFICE: AFWAL/FI

SUBMITTED BY

AUTOMATED, REMOTE MEASUREMENT OF FATIGUE CRACK GROWTH TO A PRECISION OF 0.025 MM IN A TEMPERATURE FIELD UP TO 2,000 DEG F CAN BE DONE WITH A RELATIVELY SIMPLE, HENCE LOW COST SYSTEM. THE KEY TO THIS SYSTEM IS THE SENSOR, AND THEREFORE, WE HAVE SELECTED TWO APPROACHES IN TWO ENERGY RANGES (VISIBLE AND X-RAY) TO PROVIDE MAXIMUM FLEXIBILITY IN IMPLEMENTING THIS SYSTEM. WE BELIEVE THE CONFIGURATION AND INTERFACES WITH THE FATIGUE TESTING MACHINE AND THE SPECIMEN FURNACE WILL BE IMPORTANT FACTORS IN THE DESIGN OF THE PROPOSED SYSTEM. THEREFORE, THE SENSOR FREQUENCY AND CONFIGURATION SHOULD NOT BE SELECTED UNTIL ALL THESE INTERFACES ARE KNOWN AND WELL UNDERSTOOD. THE PROPOSED PHASE I PROGRAM WILL EXAMINE ALL THESE INTERFACES, INTEGRATE THEM WITH THE PERFORMANCE REQUIREMENTS AND MAKE A SELECTION. A LABORATORY TEST WILL THEN BE CONDUCTED TO VERIFY FEASIBILITY AND ATTAINABLE PRECISION. A SYSTEM WILL BE DESIGNED BASED ON THE TEST DATA AND IT WILL FORM THE BASIS FOR A PHASE I PROGRAM.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER: F33615-87-C-2786
GARY CZUPRYNA
TITLE:
AIR SEPARATION BY MOLECULAR SIEVE ZEOLITE MEMBRANES
TOPIC# 129 OFFICE: AFWAL/PO

PRESSURE SWING ABSORPTION SYSTEMS UTILIZING MOLECULAR SIEVE ZEOLITES HAVE BEEN USED SUCCESSFULLY TO PRODUCE HIGH PURITY OXYGEN FROM AIR FOR BOTH LARGE AND SMALL SCALE AIR SEPARATION SYSTEMS. THESE SYSTEMS HAVE BEEN EXTENSIVELY EVALUATED BY THE DEPARTMENT OF DEFENSE AS LIFE SUPPORT SYSTEMS ABOARD MILITARY AIRCRAFT. HOWEVER, THE VOLUME AND WEIGHT OF SUCH SYSTEMS WOULD BE PROHIBITIVE FOR THE VERY HIGH AIR HANDLING RATES REQUIRED FOR THE IN-FLIGHT COLLECTION AND STORAGE OF OXYGEN FOR SUBSEQUENT ROCKET USE. A NOVEL CONCEPT FOR OXYGEN/NITROGEN SEPARATION INVOLVING THE USE OF CONTINUOUS MOLECULAR SIEVE ZEOLITE POLYMER MICROPOROUS MEMBRANES IS PROPOSED FOR THE PHASE I PROGRAM. ZEOLITES EMBEDDED EITHER WITHIN THE MATRIX OR ON THE SURFACE OF THE MEMBRANE WILL ADSORB NITROGEN TO THE EXCLUSION OF OXYGEN. THIS APPROACH OFFERS THE ADVANTAGES OF DEVELOPING A GAS SEPARATION SYSTEM BASED ON POROUS POLYMER MATRIX GEOMETRIES (HIGH AIR FLOW RATES, LOWER

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VOLUME AND WEIGHT SYSTEMS) AND BEING ABLE TO TAILOR THE ADSORPTIVE PROPERTIES OF THE MATRIX/ZEOLITE SYSTEM. THE OVERALL OBJECTIVE OF THE PHASE I PROGRAM WOULD BE TO DETERMINE THE CONCEPT FEASIBILITY BY FABRICATING DIFFERENT ZEOLIT/MATRIX MEMBRANES AND MEASURING THEIR PERMEABILITY AND SEPARATION EFFICIENCY.

FOWLER-MULLIN ASSOCS
5255 EDGEWORTH RD
SAN DIEGO, CA 92109
CONTRACT NUMBER:
ROY FOWLER
TITLE:
ANTI-BALLISTIC MISSILE (ABM) DEFENSE AIR JAMMERS ON DE
BALLISTIC UPPER STAGES (BUS)
TOPIC# 216 OFFICE: BMO/MYSC

IN PHASE I THE STUDY WILL DETERMINE THE FEASIBILITY OF DEPLOYING AN ECM SYSTEM ON AN ICBM BUS TO JAM AN ABM RADAR. THE CRITICAL ITEMS TO FEASIBILITY ARE THE DEFINITION OF APPROPRIATE OFFENSE-DEFENSE SCENARIOS AND THE TAILORING OF REENTRY VEHICLE AND BUS TRAJECTORIES. COMBINATIONS OF ANTENNA DESIGNS AND TRANSMITTER POWERS WILL BE DETERMINED FOR APPLICATION TO A MMIII BUS DEPLOYING BALLISTIC AND MANEURVERING REENTRY VEHICLES WITH AND WITHOUT PEN AIDS. AN INITIAL PACKAGING STUDY WILL BE PERFORMED FOR A BASELINE CONCEPT. THE PENETRATION EFFECTIVENESS OF BUS/ECM WILL BE DETERMINED AND COMPARED WITH ALTERNATIVE PENETRATION TECHNIQUES. A PHASE II HARDWARE DEVELOPMENT AND TEST PROGRAM PLAN WILL BE PREPARED. FOWLER-MULLIN ASSOCIATES WILL BE SUPPORTED BY GE AS CONSULTANTS FOR MMIII DESIGN DATA AND HARDWARE DEVELOPMENT PLANNING.

FRONTIER ENGINEERING INC
424 SQUIRES ST
STILLWATER, OK 74074
CONTRACT NUMBER:
DOUG PORTER
TITLE:
PROPOSAL TO DEVELOP TECHNIQUES FOR EXPERT SYSTEM APPLI
MEDICAL DIAGNOSTICS
TOPIC# 88 OFFICE: AMD/RDO

SUBMITTED BY

THIS SBIR PROPOSAL DESCRIBES A PROJECT IN WHICH TECHNIQUES ARE DEVELOPED FOR APPLYING EXPERT SYSTEMS THAT AID CLINICIANS DURING INTERPRETATION OF NUCLEAR MEDICINE AND PHOTOGRAPHIC IMAGES, AS WELL AS PHYSIOLOGICAL ANALOG SIGNALS SUCH AS ELECTROCARDIOGRAMS. THE TECHNIQUES WHICH EMBODY ACCEPTED AND PROVEN KNOWLEDGE BASES AND AN ACCEPTED REASONING MECHANISM SERVE AS A STANDARD BY WHICH FUTURE DIAGNOSIS CAN BE MADE.

FRONTIER TECHNOLOGY INC
5266 HOLLISTER AVE - STE 215
SANTA BARBARA, CA 93111
CONTRACT NUMBER: F04701-87-C-0117
JOHN BALLANTINE
TITLE:
BEAM SYNCHRONIZATION AND COHERENCE TECHNIQUES FOR A DI
SPARSE ARRAY (DSA) OF SPACECRAFT
TOPIC# 173 OFFICE: SD/SPO

THE PROPOSED RESEARCH PROGRAM WILL DEFINE AND ANALYZE TECHNIQUES FOR MAINTAINING SYNCHRONIZATION AND COHERENCE OF A DISTRIBUTED SPARSE ARRAY (DSA), WILL IDENTIFY THE MOST PROMISING TECHNIQUE OR TECHNIQUES, AND WILL PROVIDE A PLAN FOR FURTHER EVALUATION AND DEMONSTRATION OF THE MOST PROMISING TECHNIQUES. THE ANALYSIS WILL RELATE THE PERFORMANCE OF THE SYNCHRONIZATION AND COHERENCE TECHNIQUES, IN TERMS OF THE LOSS OF GAIN AND OTHER ANTENNA-PATTERN DEGRADATIONS THEY ALLOW, TO THE STABILITY, ELEMENT LOCATION MEASUREMENT, AND DATA PROCESSING REQUIREMENTS THEY IMPOSE. THE IDENTIFICATION OF THE MOST PROMISING TECHNIQUES WILL BE BASED ON THE RESULTS OF THIS ANALYSIS, TOGETHER WITH AN ASSESSMENT OF THE TECHNOLOGY REQUIREMENTS FOR IMPLEMENTING THE TECHNIQUES.

FRONTIER TECHNOLOGY INC
5266 HOLLISTER AVE - STE 215
SANTA BARBARA, CA 93111
CONTRACT NUMBER:
ROBERT G UTTLEY
TITLE:
MaRV EVASIVE TRAJECTORY OPTIMIZATION
TOPIC# 219 OFFICE: BMO/MYSC

SUBMITTED BY

THE OBJECTIVE OF THIS PROPOSAL IS TO DEVELOP A SOUND THEORETICAL BASIS FOR THE SELECTION OF MaRV EVASION AND INTERCEPTOR PURSUITE TRAJECTORY OPTIMIZATION BY (1) PROVIDING CONFIDENCE THAT THE EXPECTED ENGAGEMENT OUTCOME IS OFFENSE-ENFORCEABLE (I.E. THE DEFENSE CANNOT MAKE BETTER USE OF ITS CAPABILITIES) AND (2) REDUCING THE FURTHER COMPUTATIONAL EFFORT INVOLVED IN HIGH FIDELITY SIMULATIONS BY PROVIDING A GOOD STARTING POINT FOR STRATEGY REFINEMENT. WE PROPOSE TO START AS SIMPLY AS IS APPROPRIATE AND PROGRESSIVELY EXPAND THE NUMBER OF FACTORS INCLUDED IN THE ANALYSIS. THE MaRV WILL ALWAYS BE "BLIND". INITIALLY WE GIVE IT KNOWLEDGE OF INTERCEPTOR LAUNCH TIME AND LAUNCH SITE; THE DEFENSE HAS PERFECT INFORMATION; VEHICLE AND INTERCEPTOR DYNAMICS ARE SIMPLE AND 2-DIMENSIONAL. IF WE CAN SOLVE THIS GAME THE NEXT STEPS IN PHASE I ARE TO ESTIMATE THE FEASIBILITY AND COMPUTATIONAL EFFORT OF OBTAINING SOLUTIONS IN 3-DIMENSIONS AND WITH HIGHER FIDELITY DYNAMICS. INTERCEPTOR LAUCH TIME AND SITE UNCERTAINTIES WOULD BE ADDRESSED MAINLY IN PHASE II. ANALYSIS RESULTS ARE APPLICABLE ALSO TO THE BGV IN BOTH TERMINAL AND GLIDE PHASES.

GELTECH INC
ONE PROGRESS BLVD - BOX 18
ALACHUA, FL 32615
CONTRACT NUMBER: FQ8671-8701498
SHI HO WANG
TITLE:
DEVELOPMENT OF A HIGH FREQUENCY Q-SWITCHED GLASS LASER PROCESSING
TOPIC# 241 OFFICE: AFOST/XOT

EXISTING GLASS MATRIX LASERS UTILIZE NEODYMIUM DOPING OF A SILICATE MATRIX. THE INABILITY TO USE A SiO2 MATRIX RESULTS IN AN EFFICIENCY OF 3% OR LESS. THE LOW THERMAL CONDUCTIVITY OF GLASS COUPLED WITH THE RELATIVELY HIGH COEFFICIENT OF THERMAL EXPANSION OF THE SILICATES LIMITS THE OUTPUT INTENSITY AND PULSE RATE IN ORDER TO PREVENT DEDOCUSING AND FILAMENTARY BREAKDOWN FROM THE THERMAL EFFECTS. THE NEW TECHNOLOGY OF SOL-GEL GLASS PRODUCTION AT LOW TEMPERATURES PERMIT THE ABILITY TO DOPE NEODYMIUM AS WELL AS RARE EARTH SENSITIZERS IN AN ULTRAPURE SiO2 MATRIX. THE SOL-GEL PROCESS GIVES A MATERIAL WITH A COEFFICIENT OF THERMAL EXPANSION 20 TIMES LOWER THAN LASER SILICATES. OTHER IMPROVEMENTS ARE SEEN IN THE INDEX OF REFRACTION, NON-LINEAR

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INDEX AND ABBE NUMBER. BY USING THE SOL-GEL METHOD TO PRODUCE Nd DOPED GLASS LASERS, A MUCH HIGHER EFFICIENCY WILL BE OBTAINED WHICH WILL ALLOW GLASS LASERS TO BE USED FOR RAPID INFORMATION PROCESSING AND DATA ACQUISITION IN APPLICATIONS AND ENVIRONMENTS NOT CURRENTLY POSSIBLE.

GENERAL APPLIED SCIENCE LABS INC (GASL)
77 RAYNOR AVE
RONKONKOMA, NY 11779
CONTRACT NUMBER:
DR ROBERT G RAY
TITLE:
IMPROVED MANEUVERING REENTRY VEHICLE SIZING ANALYSIS
TOPIC# 229 OFFICE: BMO/MYSC

THE OVERALL OBJECTIVE OF THE EFFORTS IN PHASE I AND II IS TO DETERMINE THE EFFECTS OF INITIAL NOSE RADIUS, FOREBODY ANGLE, NOSE TIP MATERIALS, WEATHERING EROSION, AND MISSION TRAJECTORY ON THE DEVELOPING NOSE SHAPE AND REQUIRED OVERHANG FOR MEMBERS OF A GENERIC CLASS OF MANEUVERING AND/OR HOME SEEKING REENTRY VEHICLES. ONE FEATURE OF MEMBERS OF THIS CLASS IS THAT THEIR INITIAL NOSE RADIUS IS RELATIVELY SMALLER THAN THAT OF VEHICLES WHICH HAVE BEEN CONSIDERED IN THE PAST AND, HENCE, THERE IS EXPECTED TO BE GREATER RECESSION. A COMPUTER CODE SHAPE, WHICH WAS DEVELOPED A FEW YEARS AGO BY AVCO SYSTEMS TEXTRON IN CONJUNCTION WITH OUTSIDE CONSULTANTS ONE OF WHOM IS THE PRINCIPAL INVESTIGATOR FOR THIS PROPOSAL, WILL BE ADAPTED FOR USE IN COMPUTING THESE EFFECTS.

GENERAL IMAGING CORP
901 NW 8TH AVE - STE B-1
GAINESVILLE, FL 32601
CONTRACT NUMBER: 87-C-0323
JOHN D COX
TITLE:
ADVANCED RADIOGRAPHIC TECHNIQUES UTILIZING A SOLID-STA
ELECTRONIC IMAGER
TOPIC# 17 OFFICE: AD/ASI

SUBMITTED BY

NONDESTRUCTIVE EVALUATION OF MUNITIONS PRESENTS SPECIAL PROBLEMS THAT CANNOT BE SOLVED WITH CONVENTIONAL TECHNIQUES. AN ELECTRONIC X-RAY IMAGING SYSTEM WILL BE STUDIED TO DETERMINE THE FEASIBILITY OF ITS USE IN ADVANCED RADIOGRAPHIC IMAGING TECHNIQUES SUCH AS REMOTE ON-LINE INSPECTION, MULTISPECTRAL RADIOGRAPHY AND BACKSCATTER TOMOGRAPHY.

GENERAL SCIENCES INC
655 S GRAVERS RD
PLYMOUTH MEETING, PA 19462
CONTRACT NUMBER: F33615-87-C-5276
DR J GEBHARDT
TITLE:
HIGH TEMPERATURE LIQUID FILM OXYGEN BARRIER
TOPIC# 99 OFFICE: AFWAL/ML

THE USE OF A LIQUID METAL FILM IS PROPOSED AS A BARRIER FOR PREVENTING ACCESS OF OXYGEN TO CARBON-CARBON COMPOSITES AT TEMPERATURES TO 4500 DEG F. THE LIQUID FILM IS COMPRISED OF A NOBLE METAL, INSOLUBLE IN A POROUS TUNGSTEN LAYER PREVIOUSLY APPLIED AS AN EROSION RESISTANT LAYER. AN IRRIDIUM LAYER COMPRISES THE MEANS OF PROTECTING THE TUNGSTEN LAYER FROM CARBIDING REACTIONS WITH THE SUBSTRATE. PRELIMINARY SCREENING TESTS WILL BE BASED ON USE OF AN OXHYDROGEN TORCH AND PHYSICAL CHANGES IN THE SUBSTRATE AFTER EXPOSURE. VARIATIONS IN COMPOSITION OF THE LIQUIDUS TEMPERATURE. THE INFLUENCE OF SUBSTRATE STRUCTURE AND COMPOSITION WILL BE EXAMINED BY USING CARBON AND GRAPHITE BASED MATERIALS OF VARYING POROSITY. OBSERVATIONS AND MEASUREMENTS MADE WILL SERVE TO ESTABLISH A BASE FOR PROJECTING THE VIABILITY AND PRACTICALITY OF THIS APPROACH AND RECOMMENDATIONS FOR FUTURE WORK WILL BE PROVIDED.

GENERAL SCIENCES INC
655 S GRAVERS RD
PLYMOUTH MEETING, PA 19462
CONTRACT NUMBER: F33615-87-C-3011
DONALD E NESTLER
TITLE:
FLOW FIELD SEPARATION APPROXIMATIONS FOR HYPERSONIC AE
TOPIC# 118 OFFICE: AFWAL/FI

SUBMITTED BY

A STUDY IS PROPOSED TO DEVELOP MORE ACCURATE APPROXIMATE METHODS FOR PREDICTING FLOW SEPARATION PHENOMENA ON HYPERSONIC MANEUVERING AEROSPACE VEHICLES. EXPERIMENTAL DATA AND FLOW FIELD COMPUTATIONS WILL BE USED TO DERIVE IMPROVED SEMI-EMPIRICAL RELATIONS FOR INCIPIENT SEPARATION, SEPARATED REGION GEOMETRY, SURFACE PROPERTIES, AND FLOW FIELD PROFILES FROM SURFACE TO INVISCID EDGE OF THE SEPARATED REGION. THE MAJOR TYPES OF FLOW SEPARATION THAT WILL BE STUDIED INCLUDE LEESIDE, WINDWARD CONTROL SURFACES, AND SHOCK IMPINGEMENT ON ADJACENT SURFACES.

GENERAL SCIENCES INC
655 S GRAVERS RD
PLYMOUTH MEETING, PA 19462
CONTRACT NUMBER:
HOWARD SEMON
TITLE:
EXPLUSION TECHNIQUES
TOPIC# 224 OFFICE: BMO/MYSC

A STUDY IS PROPOSED TO DEFINE AND EVALUATE FEASIBILE JAMMER EXPULSION CONCEPTS FOR THE HOMING PRECURSOR JAMMER (HPJ) SYSTEM, AND TO ASSESS THE IMPLICATIONS OF CANDIDATE EXPULSION CONCEPTS ON JAMMER AEROTHERMODYNAMIC PERFORMANCE AND REQUIREMENTS. CONCEPTS WHICH FEATURE THE SEQUENTIAL EXPULSION/EJECTION OF INDIVIDUAL JAMMERS AXIALLY OUT THE REAR OF THE CARRIER VEHICLE WILL BE EMPHASIZED. RELIABLE CONTROLLABLE EXPULSION TECHNIQUES WHICH ACCOMMODATE VIABLE JAMMER CONFIGURATIONS WILL BE SOUGHT. EXPULSION SUBSYSTEM REQUIREMENTS INCLUDING JAMMER EJECTION VELOCITIES AND FORCES WILL BE ESTABLISHED FOR APPROPRIATE HPJ CARRIED VEHICLE TRAJECTORIES, AND THE EFFECT OF THE EXPULSION PROCESS ON THE CARRIER VEHICLE AND JAMMER AEROTHERMODYNAMIC PERFORMANCE WILL BE ASSESSED.

GENERAL TECHNOLOGY INC
12903 AUTUMN DR
SILVER SPRING, MD 20904
CONTRACT NUMBER:
YONG S KIM
TITLE:
GRAVITY EFFECTS IN SMALL SCALE STRUCTURAL MODELING
TOPIC# 72 OFFICE: AFESC/RDXP

SUBMITTED BY

A FEASIBILITY STUDY IS PROPOSED TO INVESTIGATE THE GRAVITATIONAL EFFECTS IN SMALL-SCALE MODELING WITHOUT USING CENTRIFUGE MODEL TECHNIQUE. THE STUDY WILL CRITICALLY REVIEW THE EXISTING STATE-OF-THE-ART THEORY AND PRACTICE OF SCALE MODELING TECHNIQUES AND EVALUATE THEIR ABILITY TO ACCURATELY SIMULATE THE SOIL AND STRUCTURAL BEHAVIORS. THE FINDINGS OF THIS STUDY WILL IDENTIFY THE VARIABLES MOST INFLUENCED BY GRAVITATIONAL EFFECTS, AND CONCEPTS AND PROCEDURES WILL BE DEVELOPED FOR COMPENSATING THE GRAVITATIONAL EFFECTS WITHOUT USING ARTIFICALLY-INDUCED GRAVITY. FURTHERMORE, THE GRAVITATIONAL EFFECTS RELATED TO SCALE WILL BE INVESTIGATED USING A NUMERICAL TECHNIQUE, AND A PRELIMINARY SMALL-SCALE LABORATORY MODEL STUDY WILL BE PERFORMED TO DEMONSTRATE THE FEASIBILITY AND CAPABILITY OF SUCH TECHNIQUES. THE RESULTS OF THE PHASE I STUDY WILL BE USED AS A FOUNDATION FOR THE PHASE II STUDY THAT WILL PROVIDE A COMPREHENSIVE COMPARISON STUDY BETWEEN THE RESULTS OF CENTRIFUGE MODEL STUDY AND NEW MODEL STUDY DEVELOPED IN PHASE I AND PREDICTIONS BY NUMERICAL ANALYSIS.

GEO-CENTERS INC
7 WELLS AVE
NEWTON CENTRE, MA 02159
CONTRACT NUMBER:
DR DAVID K FRIDAY
TITLE:
A NON-DESTRUCTIVE TEST TO DETECT CHANNELING IN FILTERS
TOPIC# 89 OFFICE: AMD/RDO

CHANNELING CAN SEVERELY REDUCE FILTER LIFE. THUS, A NON-DESTRUCTIVE METHOD TO DETECT CHANNELING IS REQUIRED TO ENSURE THE ACCEPTABLE PERFORMANCE OF A CARBON FILTER WHILE MAINTAINING ITS PROTECTIVE LIFE. IN THE PHASE I FEASIBILITY EFFORT, SEVERAL TEST BEDS WILL BE INTENTIONALLY PACKED TO INDUCE VARIOUS DEGREES OF CHANNELING. NON-DESTRUCTIVE BREAKTHROUGH EXPERIMENTS WILL BE PERFORMED USING AN APPROPRIATELY SELECTED VAPOR THAT WEAKLY ADSORBS. THE RESULTS WILL BE ANALYZED USING A MODIFIED VERSION OF THE WHEELER EQUATION AS A MEASURE OF THE EXTENT OF CHANNELING. FOLLOWING COMPLETE ELUTION OF THE WEAKLY ADSORBED VAPOR FROM THE TEST BEDS, BREAKTHROUGH TIMES WILL BE MEASURED USING THE STRONGLY ADSORBED VAPOR N-OCTANE AS THE CHALLENGE. THE BREAKTHROUGH RESULTS USING THE WEAKLY ADSORBED VAPOR WILL BE COMPARED WITH THE BREAKTHROUGH RESULTS USING N-OCTANE TO

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DETERMINE IF A CORRELATION EXISTS. THE PHASE I RESULTS WILL BE USED TO DESIGN A TEST APPARATUS AND ESTABLISH A STANDARDIZED PROTOCOL FOR DETERMINING CHANNELING IN CARBON FILTERS.

GEOMET TECHNOLOGIES INC
20251 CENTURY BLVD
GERMANTOWN, MD 20874
CONTRACT NUMBER:
FARID ASKARI
TITLE:
SYNTHETIC APERTURE RADARS
TOPIC# 239 OFFICE: BMO/MYSC

THE FEASIBILITY OF A MULTIPROCESSOR ARCHIETECTURE FOR REAL-TIME OR NEAR-REAL-TIME SYNTHETIC APERATURE RADAR (SAR) DIGITAL IMAGE FORMATION AND POSTPROCESSING WILL BE STUDIED. THE PROPOSED ARCHITECTURE WILL USE STATE-OF-THE-ART DIGITAL SIGNAL PROCESSORS AS PROCESSING ELEMENTS. NEAR-NEIGHBOR MESH AND BARREL SHIFTER (PM2I) NETWORK INTERCONNECT TOPOLOGIES WILL BE STUDIED IN TERMS OF THROUGHPUT VERSUS COMPLEXITY TRADEOFFS. ISSUES INVOLVING MEMORY STORAGE ORGANIZATION AND ACCESS FOR LARGE IMAGE RETRIEVAL AND SEGMENTATION WILL BE INVESTIGATED. IN ADDITION, IMAGE REDUCTION VERSUS COMPUTER REQUIREMENT ASSESSMENTS WILL BE MADE AGAINST THE CANDIDATE ARCHITECTURE.

GIGA-BIT LOGIC INC
1908 OAK TERRACE LN
NEWBURY PARK, CA 91320
CONTRACT NUMBER:
DR RICHARD EDEN
TITLE:
THE DESIGN AND DEVELOPMENT OF A 1750A COMPUTER CHIP SE GALLIUM ARSENIDE
TOPIC# 212 OFFICE: BMO/MYSC

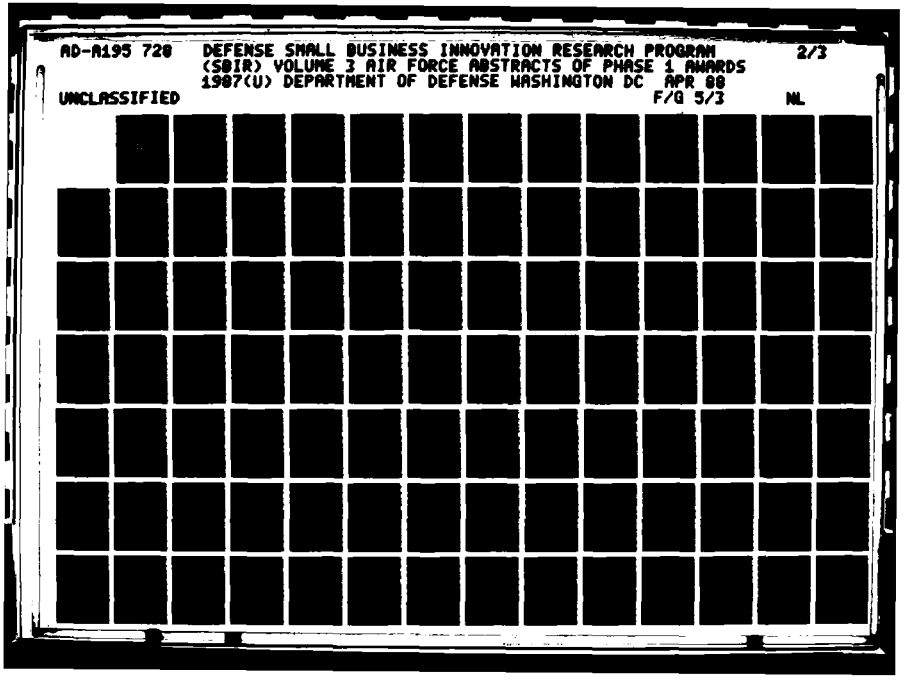
THE EVER INCREASING NEED FOR HIGHER PERFORMANCE MICROCOMPUTER COMPONENTS CAPABLE OF SATISFYING REAL TIME COMPUTATIONAL REQUIREMENTS IN CURRENT AND FUTURE MISSILE, RE-ENTRY, AND POST-BOOST VEHICLE APPLICATIONS ARE REAL AND DEMANDING NECESSITIES. CURRENTLY AVAILABLE

SUBMITTED BY

TECHNOLOGY IS BEING TAXED TO THE LIMITS OF ITS PERFORMANCE CAPABILITIES ESPECIALLY IN THE AREA OF NUCLEAR HARDNESS. ESTIMATES OF FUTURE NUCLEAR REQUIREMENTS PLACE MANY PROJECTED SYSTEMS AND THEIR MISSIONS IN JEOPARDY. THIS SBIR PROGRAM INTENDS TO PROVIDE A GENERALLY USEFUL, FAST, NUCLEAR HARD MICROCOMPUTER THROUGH A PROPOSED DESIGN AND DEVELOPMENT EFFORT AIMED AT IMPLEMENTING A 1750A COMPUTER CHIP SET IN GALLIUM ARSENIDE. GALLIUM ARSENIDE IS AN INHERENTLY HARD, VERY FAST, SEMICONDUCTOR MATERIAL WHICH WILL PROVIDE AN ORDER OF MAGNITUDE OR MORE IMPROVEMENT IN HARDNESS AND PERFORMANCE LEVELS. THIS DEVELOPMENT SHOULD ULTIMATELY LEAD TO THE PRODUCTION OF A MICROCOMPUTER CHIP SET WHICH YIELDS A VAST IMPROVEMENT IN BOTH NUCLEAR HARDNESS AND COMPUTATIONAL POWER APPLICABLE FOR MILITARY AS WELL AS COMMERCIAL MARKETS.

GLYNN SCIENTIFIC INC
73 FRANKLIN ST
ANNAPOLIS, MD 21401
CONTRACT NUMBER: 87-C-0341
THOMAS W GLYNN
TITLE:
BOMB TERMINAL GUIDANCE
TOPIC# 2 OFFICE: AD/XRX

GSI HAS DEVELOPED BOTH DUAL MODE MMW/IR SENSORS AS WELL AS TERMINAL SEEKERS FOR MLRS-TGW (MARTIN AND RAYTHEON), SADARM (AVCO), CGSP (BENDIX), AND OTHER PROGRAMS OVER THE LAST FEW YEARS. WE ARE ALSO PRESENTLY DEVELOPING A LOW COST ELECTRONICALLY STEERED, MONOPULSE STRAP DOWN SEEKER FOR HIGH SPEED INTERCEPTED TERMINAL GUIDANCE. THIS PHASE I TASK WILL INVESTIGATE THE USE OF A NUMBER OF DIFFERENT INEXPENSIVE TERMINAL SEEKERS UTILIZING IR, MMW, PASSIVE RADIOMETRY, LIDAR, AND VARIOUS COMBINATIONS TO PROVIDE LIMITED DETECTION CAPABILITY (SMALL SEARCH AREA) AND TERMINAL GUIDANCE. THE INVESTIGATION WILL START WITH THE DETERMINATION OF SEEKER REQUIREMENTS BASED ON EXPECTED TRAJECTORIES, SEARCH AREAS, APPROACH ANGLES, TARGET CHARACTERISTICS, ETC. THE INVESTIGATION WILL COVER SCAN TECHNIQUES AND WAVEFORM CHARACTERISTICS FOR VARIOUS TYPE SENSORS TO DETERMINE A NUMBER OF POTENTIAL TERMINAL GUIDANCE SCHEMES. THESE WILL BE TRADED USING CRITERIA OR PERFORMANCE [CEP, PK (IF VULNERABILITY AVAILABLE)], VOLUME REQUIRED, UNUSUAL (UNBOMBLIKE) TRAJECTORY REQUIREMENTS, AND


AD-A195 720 DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM 2/3
(SBIR) VOLUME 3 AIR FORCE ABSTRACTS OF PHASE 1 AWARDS
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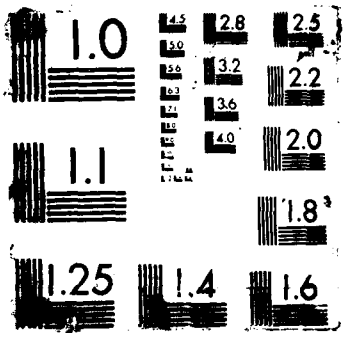
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SUBMITTED BY

ULTIMATELY SEEKER COST (IN HIGH VOLUME PRODUCTION). GSI WILL ALSO DEFINE A CONCEPT VALIDATION PHASE II FOR THE MOST SUCCESSFUL CANDIDATE.

GT-TECH INC
5 MEADOW MIST CT
REISTERSTOWN, MD 21136
CONTRACT NUMBER: F19628-87-C-0170
EDGAR H GERMAN JR
TITLE:
ADAPTIVE/AI COMMUNICATIONS C3CM ALLEVIATION
TOPIC# 36 OFFICE: ESD/XR

EVOLVING WEAPONS, TACTICS, AND THE COMMAND AND CONTROL STRUCTURE DEMAND FLEXIBLE, RELIABLE, AND HIGH RATE COMMUNICATIONS. FLEXIBILITY MUST INCLUDE INTEROPERABILITY, CONNECTIVITY, AND RECONSTRUCTABILITY. RELIABILITY MUST BE MAINTAINED IN A DYNAMIC, HOSTILE ELECTROMAGNETIC ENVIRONMENT. UNFRIENDLY C3CM ATTACKS ARE BOTH PASSIVE AND ACTIVE WITH BANDWIDTH AND DATA RATE BECOMING EXTREMELY SCARCE UNDER THESE CONDITIONS. AN "ADAPTIVE/AI" TRANSFORM DOMAIN SPREAD SPECTRUM COMMUNICATIONS TRANSCEIVING AND NETWORK SYSTEM, WITH INHERENT EW CAPABILITY, IS PROPOSED FOR IMPROVED SYSTEM PERFORMANCE AGAINST C3CM ATTACKS. ADAPTIVE NETWORKING CAPABILITY IS POSSESSED BY THE PROPOSED SYSTEM, DUE TO THE ABILITY OF THE TRANSCEIVER TO MODIFY THE TRANSMITTED WAVEFORM POWER AND SPECTRAL CHARACTERISTICS. ARTIFICAL INTELLIGENCE EXPERT SYSTEMS TECHNIQUES ARE ALSO PROPOSED FOR INVESTIGATION TO "BUILD-IN" DESIGN AND FIELD EXPERIENCE IN CONTROLLING THE TRANSCEIVER AND NETWORK.

HARDING ASSOCS (dba HARDING LAWSON ASSO)
PO BOX 578 - 7655 REDWOOD BLVD
NOVATO, CA 94947
CONTRACT NUMBER:
ROBERT D JONES
TITLE:
MODIFIERS FOR ASPHALT CONCRETE
TOPIC# 67 OFFICE: AFESC/RDXP

SUBMITTED BY

ONE OF THE MAJOR PROBLEMS AFFECTING THE PERFORMANCE OF AIR FORCE ASPHALT CONCRETE PAVEMENTS IS PERMANENT DEFORMATION (RUTTING) ASSOCIATED WITH HIGH TEMPERATURE SERVICE. BECAUSE MANY CURRENT AND FUTURE GENERATIONS OF AIRCRAFT REQUIRE HIGH-PRESSURE TIRES AND THRUST VECTORING, IT IS EXPECTED THAT RUTTING PROBLEMS WILL INCREASE IN THE FUTURE. A HOST OF PRODUCTS ARE AVAILABLE, HOWEVER, WHICH CAN BE USED TO MODIFY THE NATURAL PROPERTIES OF AN ASPHALT CONCRETE. THE OBJECTIVES OF THIS RESEARCH ARE TO IDENTIFY THE MOST PROMISING TYPES OF ADDITIVES FOR REDUCING PERMANENT DEFORMATION IN AIRFIELD PAVEMENT. SELECTION WILL BE BASED ON (1) A LITERATURE REVIEW, (2) LABORATORY TESTING OF SELECTED BINDER AND BINDER-AGGREGATE MIXTURES, (3) FIELD PERFORMANCE ESTIMATES, AND (4) AN ANALYSIS OF ECONOMIC FEASIBILITY. BINDER TESTS WILL INCLUDE PENETRATION AND VISCOSITY AT TWO TEMPERATURES AND DUCTILITY. THESE TESTS WILL BE PERFORMED BEFORE AND AFTER AGING IN A ROLLING THIN-FILM OVEN. MIXTURE TESTS WILL INCLUDE MARSHALL STABILITY AND FLOW, RESILIENT MODULUS AT TWO TEMPERATURES, CREEP AT TWO TEMPERATURES, AND SPLITTING TENSILE STRENGTH. THE MIXTURE TEST RESULTS WILL BE USED WITH STATE-OF-THE-ART ANALYTICAL TECHNIQUES TO ESTIMATE THE ADDITIVES EFFECTS ON FIELD PERFORMANCE.

HITTITE MICROWAVE CORP
21 CABOT RD
WOBURN, MA 01801
CONTRACT NUMBER:
LEONARD D REYNOLDS
TITLE:
DYNAMIC MATCHING TECHNIQUES FOR MMIC MODULES
TOPIC# 42 OFFICE: RADC/XPX

THE ELIMINATION OF FERRITE-BASED ISOLATER- OR CIRCULATOR-LIKE COMPONENTS FROM ACTIVE-APERTURE PHASED ARRAY SURVEILLANCE RADAR SYSTEMS IS DESIRABLE. THE PRESENCE OF SUCH COMPONENTS CONFLICTS WITH THE CONCEPT OF MICROWAVE MONOLITHIC INTEGRATED CIRCUIT CONCEPTS AND INCREASES THEIR COST, SIZE, AND WEIGHT. IN THIS PROPOSAL TWO DISTINCT AND FUNDAMENTALLY DIFFERENT APPROACHES ARE PRESENTED AND COMPARED. THE POTENTIAL APPLICATION OF THESE CIRCUITS TO MODULE TECHNOLOGY ARE DISCUSSED.

HITTITE MICROWAVE CORP
21 CABOT RD
WOBURN, MA 01801
CONTRACT NUMBER: F33615-87-C-1485
LEONARD D REYNOLDS
TITLE:
MODULAR AND RECONFIGURABLE COMPUTER-AIDED DESIGN OF MM
TOPIC# 144 OFFICE: AFWAL/AA

SUBMITTED BY

MODULAR AND RECONFIGURABLE CAD TECHNIQUES ARE DESIRABLE TO MEET THE HIGH VOLUME/FAST RURN-AROUND/AFFORABLE PRODUCTION GOALS TO GIVEN SPECIFICATIONS. WITH CONVENTIONAL DESIGN APPROACHES AND WITH THE GIVEN SENSITIVITY OF MICROWAVE CIRCUITS TO LAYOUT AND PROCESS DETAILS, EACH DESIGN IS NECESSARILY CUSTOMIZED TO THE SPECIFIC PERFORMANCE REQUIREMENTS; CHANGES IN THESE REQUIREMENTS MAKE IT NECESSARY TO REPEAT THE DESIGN AND DEVELOPMENT EFFORT. THIS PROPOSAL PRESENTS NEW TOPOLOGIES WHICH MAKE POSSIBLE A MODULAR APPROACH FOR ANY OF THE GENERAL-PURPOSE COMPONENTS SUCH AS PHASE SHIFTERS, AMPLIFIERS, AND SWITCHES. THE FLEXIBILITY THAT THIS APPROACH BRINGS TO THE DESIGN AND DEVELOPMENT EFFORT IS DESCRIBED, AND ACTUAL DESIGN EXAMPLES ARE PROVIDED TO ILLUSTRATE THE APPLICATION OF THE CONCEPTS.

HOKENSON CO
840 S TREMAINE AVE
LOS ANGELES, CA 90005
CONTRACT NUMBER: 87-C-0409
DR GUSTAVE J HOKENSON
TITLE:
DRAG REDUCTION ON 20 MM AIRCRAFT CANNON PROJECTILES UT
OPTIMAL FOREBODY SHAPING
TOPIC# 1 OFFICE: AFATL/MNG

UTILIZING AN ITERATIVE-DIRECT DESIGN PROCEDURE TO OBTAIN MINIMUM DRAG AXISYMMETRIC BODIES, DEVELOPED BY THE PRINCIPAL INVESTIGATOR FOR EGLIN AFB, THE PROPOSED RESEARCH SEEKS TO CHARACTERIZE OPTIMAL FOREBODY SHAPES OF 20 MM AIRCRAFT CANNON PROJECTILES. THE WORK SHALL EXTEND THE BOUNDARIES OF CLASSICAL HYPERSONIC INVISCID FLOW OPTIMUM BODY THEORY BY ACCOUNTING FULLY FOR THE EFFECT OF THE VISCOUS FLOW ON A SPINNING AXISYMMETRIC SHAPE. BOTH FRICTIONAL DRAG AND FORM DRAG (DUE TO VISCOUS - INVICID INTERACTIONS) MODIFICANTIONS TO CLASSICAL RESULTS SHALL BE PRESENTED AS A FUNCTION OF MACH AND REYNOLDS NUMBER. THE OFF-DESIGN PERFORMANCE OF EACH OPTIMUM SHAPE SHALL ALSO BE ASSESSED IN ORDER TO OBTAIN BODIES WHICH PROVIDE NET OPTIMUM PERFORMANCE OVER THE RANGE OF MACH AND REYNOLDS NUMBERS ENCOUNTERED: 1) ALONG A GIVEN TRAJECTORY OR, 2) ON VARIOUS AIRCRAFT MISSIONS. THE EFFECT OF UNSTEADY FLIGHT, DUE TO THE DRAG-INDUCED DECELERATION, ON THE FLOWFIELD AND RESULTANT CD SHALL ALSO BE QUANTIFIED. FINALLY, THE PHASE II WORK PLAN SHALL BE PREPARED

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INCLUDING A COMPUTATIONAL EFFORT TO DEVELOP A COMPREHENSIVE LIBRARY OF OPTIMAL SHAPES, ANALYSIS OF STEADY AND DYNAMIC ANGLE-OF-ATTACK THREE-DIMENSIONALITY, AND THE FORMULATION OF AN EXTENSIVE FIELD TEST VALIDATION OF THE PHASE I RESULTS.

HOLLANDER ASSOCS
PO BOX 2276
FULLERTON, CA 92633
CONTRACT NUMBER:
G L HOLLANDER
TITLE:
MICRO-PROCESSOR BASED G AND C DATA MANAGEMENT SYSTEM--
DESIGN AND SPECIFICATION
TOPIC# 201 OFFICE: BMO/MYSC

TODAY'S MICROPROCESSORS CAN HANDLE COMPLEX REAL-TIME TASKS MORE COST-EFFECTIVELY THAN YESTERDAY'S MINI-COMPUTERS AND MAINFRAMES. THIS PROJECT IS AN INTENSE ANALYSIS AND CONCEPTUAL DESIGN OF A CRITICAL DATA MANAGEMENT SYSTEM (DMS). THE DMS MAINTAINS COMPLETE RECORDS ON GUIDANCE AND CONTROL COMPONENTS FOR BALLISTIC MISSILES TO ENSURE THEIR RELIABILITY AND READINESS. CURRENTLY, DOZENS OF TERMINALS AND DOZENS OF TEST STATIONS INTERACT WITH A CENTRAL DATA-BASE IN REAL TIME. EXPENSIVE CUSTOM SOFTWARE ENSURES THAT ALL CRITICAL TIME REQUIREMENTS ARE MET. CAN A MICROPROCESSOR ARCHITEC-TURE DO THIS EFFORT MORE COST-EFFECTIVELY, EVEN IF SOME OF THE EXIST-ING SOFTWARE MUST BE MODIFIED OR REWRITTEN? THE STUDY WILL SELECT THE BEST AMONG MANY POSSIBLE SYSTEM ARCHITECTURES. THE RESULT IS A COMPLETE DESIGN SPECIFICATION FOR THE DEVELOPMENT OF A COST-EFFECTIVE MICROPROCESSOR-BASED GUIDANCE-AND-CONTROL DATA MANAGEMENT SYSTEM FOR BALLISTIC MISSILES.

HUBB SYSTEMS INC
PO BOX 1084
HUNTSVILLE, AL 35807
CONTRACT NUMBER: F19628-87-C-
STANLEY J POREDA
TITLE:
AUTONOMOUS-DISTRIBUTED SYNCHRONIZATION OF SPACE-BASED
TOPIC# 36 OFFICE: ESD/XR

SUBMITTED BY

THE DEVELOPMENT OF AN AUTONOMOUS, DISTRIBUTED SYNCHRONIZATION CONCEPT FOR FUTURE SPACE-BASED MILITARY SYSTEMS IS PROPOSED. THE INABILITY OF CONVENTIONAL GROUND-BASED "CENTRALIZED" SYNCHRONIZATION TECHNIQUES TO MEET THE SURVIVABILITY REQUIREMENTS OF THESE SYSTEMS IS DISCUSSED AND A SPECIFIC AUTONOMOUS-DISTRIBUTED SYNCHRONIZATION (ADS) APPROACH IS DESCRIBED. THE PROPOSED WORK WILL SPECIFY THE ADS ALGORITHMS REQUIRED TO CALCULATE TIME OF DAY AND FREQUENCY STANDARD ADJUSTMENTS, THE FREQUENCY WITH WHICH SYNCHRONIZATION PROCEDURES ARE CONDUCTED AND THE TYPES OF CLOCKS TO BE EMPLOYED. THE WORK PROPOSED INCLUDES: DETERMINATION OF ADS PERFORMANCE THROUGH THE MODELING OF SYNCHRONIZATION PROCEDURES, NODAL CLOCKS AND THE SPACE COMMUNICATION NETWORK.

HUBB SYSTEMS INC
PO BOX 1084
HUNTSVILLE, AL 35807
CONTRACT NUMBER: F29601-87-C-0046
STANLEY J POREDA
TITLE:
CONCEPTUAL DEVELOPMENT OF SURVIVABLE NETWORKING FOR TH SPARSE ARRAY OF SPACECRAFT
TOPIC# 199 OFFICE: AFWL/PRC

THE PROPOSED WORK CONSISTS OF DEVELOPING A CONCEPT FOR ADAPTIVELY CONTROLLING THE COMMUNICATION NETWORK FOR THE DISTRIBUTED SPARSE ARRAY OF SPACECRAFT SYSTEM. THIS CONCEPT WILL PROVIDE FOR SCHEDULING, ACQUIRING, MAINTAINING AND TERMINATING HIGH BANDWIDTH, NARROW BEAM, SPACE-SPACE AND SPACE-AIR/GROUND LINKS IN A WAY THAT ACCOUNTS FOR THE EVER-CHANGING DSA SYSTEM GEOMETRY AND FOR DEGRADED CONDITIONS DURING TRANS-ATTACK OPERATION. THE HUBB SPACE SYSTEM ANALYSIS TOOL (HUBBSAT) WILL BE USED TO DEVELOP AND EVALUATE THESE CONCEPTS.

HUGHES ASSOCS INC
2730 UNIVERSITY BLVD W - STE 902
WHEATONG, MD 20902
CONTRACT NUMBER:
EDWARD K BUDNICK
TITLE:
FIRE PERFORMANCE AND SUPPRESSIBILITY OF COMPOSITE MATE
TOPIC# 68 OFFICE: AFESC/RDXP

SUBMITTED BY

THIS PROJECT WILL DEMONSTRATE THE FEASIBILITY OF A PROTOTYPE LABORATORY TEST PROCEDURE, INCLUDING THE MODIFICATION OF ADAPTION OF STANDARD OR NON-STANDARD LABORATORY TEST METHODS, TO PROVIDE CRITICAL DATA ON DECOMPOSITION AND BURNING CHARACTERISTICS OF COMPOSITE MATERIALS, AND ON SUPPRESSIBILITY EFFECTS. SUCH DATA WILL BE USEFUL IN SCREENING CANDIDATE COMPOSITES FOR AIRCRAFT APPLICATIONS RELATIVE TO SURVIVABILITY AND EQUIPMENT PERFORMANCE.

HYPERSONICS INC
164 FERNE CT
PALO ALTO, CA 94306
CONTRACT NUMBER:
PAUL J CONTI
TITLE:
COMPUTATIONAL TOOL FOR ANTENNA WINDOW ABLATION
TOPIC# 240 OFFICE: BMO/MYSC

CURRENT SHAPE-CHANGE COMPUTER CODES USED TO PREDICT ANTENNA WINDOW (AW) EROSION PLACE EMPHASIS ON THE PHYSICS OF THE ABLATION/MELTING PROCESS. ONE OF THEIR WEAKEST AREAS IS THE CALCULATION OF THE HEAT INPUT FROM THE HYPERSONIC FLOW. THIS PROPOSAL ADDRESSES THE ADAPTATION OF AN ADVANCED NAVIER-STOKES COMPUTER CODE TO THE AW FLOW PROBLEM, TO PREDICT THE HEAT INPUT FROM THE FLOW, INCLUDING THE COMPLEX INTERACTION WITH THE AW SHAPE. IN A PHASE I EFFORT, A NEWLY DEVELOPED AIR FORCE COMPUTER CODE WILL BE ADAPTED TO THE AW FLOWFIELD PROBLEM AND EXERCISED IN A 2 DIMENSIONS TO ASSESS THE FEASIBILITY OF MORE ADVANCED, THREE-DIMENSIONAL NUMERICAL SIMULATIONS.

I-SYSTEMS (INTELLIGENT SYSTEMS)
12411 - 100TH ST N
STILLWATER, MN 55082
CONTRACT NUMBER:
DR CHARLES J GORDON
TITLE:
AI AND ADA FOR DECISION SUPPORT SYSTEMS
TOPIC# 61 OFFICE: RADC/XPX

THIS PROPOSAL WILL DETERMINE THE MERIT AND FEASIBILITY OF A

SUBMITTED BY

RECOMMENDED METHODOLOGIES (WHICH BEST LINK THE ADA DEVELOPMENT ENVIRONMENT, WITH THE RAPID PROTOTYPING DEVELOPMENT PROCESS ASSOCIATED WITH AI APPLICATIONS THAT ARE WRITTEN IN EITHER LISP OR PROLOG LANGUAGE) BY MAPPING BETWEEN APSE AND ASE AND THE MAPPING OF THE SUPPORT ENVIRONMENT INTO THE ADA SUPPORT ENVIRONMENT. THE SECOND SUB-PROBLEM IS TRANSLATION OF ALREADY DEVELOPED AI APPLICATIONS IN LISP AND PROLOG INTO ADA.

IAP RESEARCH INC
2763 CULVER AVE
DAYTON, OH 45429
CONTRACT NUMBER: 87-C-0111
DAVID P BAUER
TITLE:
EM GUN FOR LONG ROD PENETRATORS
TOPIC# 1 OFFICE: AFATL/SAS

THE OBJECTIVE OF THIS PROGRAM IS TO DEVELOP A MULTI-RAIL RAILGUN AND A MULTI-ARMATURE LONG ROD PENETRATORS FOR ANTI-ARMOR APPLICATION. PRELIMINARY ANALYSIS INDICATES THAT RODS OF L/D BETWEEN 20-30 CAN BE LAUNCHED TO VELOCITIES OF 2 TO 4 KM/S, SIGNIFICANTLY INCREASING THE PRESENT STATE-OF-THE-ART IN ANTI-ARMOR WEAPONRY. KEY TECHNICAL ISSUES ARE INTER-RAIL INSULATION OF THE MULTI-RAIL GUN AND ARMATURE/SABOT INTERFACE WITH EXTREMELY HIGH L/D RODS.

IAP RESEARCH INC
2763 CULVER AVE
DAYTON, OH 45429
CONTRACT NUMBER: F33615-87-C-2794
JOHN P BARBER
TITLE:
ADVANCED MAGNETIC TURBINE BEARINGS
TOPIC# 136 OFFICE: AFWAL/PO

MAGNETIC BEARINGS HAVE POTENTIAL FOR LONG LIFE OPERATION AT HIGH SPEEDS AND HIGH TEMPERATURES. THE OBJECTIVE OF THIS PROGRAM IS TO DEVELOP MAGNETIC BEARINGS WITH ADEQUATE LOAD AND STIFFNESS CAPABILITY FOR APPLICATION TO ADVANCED TURBINE USE. A NOVEL, NON-FERROMAGNETIC

SUBMITTED BY

APPROACH WILL BE INVESTIGATED. DETAILED MECHANICAL, MAGNETIC, AND THERMAL ANALYSIS WILL BE PERFORMED TO DETERMINE FEASIBILITY.

ICON CONSULTANTS
1232 KRIN AVE
BIRMINGHAM, AL 35213
CONTRACT NUMBER:
DR GREGG E IRVIN
TITLE:
THE RECOVERY OF DEPTH INFORMATION IN THE HUMAN VISUAL
TOPIC# 86 OFFICE: AMD/RDO

THE GOAL OF THE OVERALL PROGRAM IS TO INVESTIGATE THE RELEVANT INFORMATION CONTENT CONTAINED IN A PHYSIOLOGICALLY BASED MODEL OF THE HUMAN VISUAL SYSTEM WITH REGARDS TO THE EFFICIENT AND EFFICACIOUS EXTRACTION OF DEPTH THROUGH STEREOPSIS. IN THE CONTEXT OF A MODEL OF THE HUMAN VISUAL SYSTEM THIS APPROACH UTILIZES THE PHYSIOLOGICAL INFORMATION FILTERING CHARACTERISTICS KNOWN TO EXIST IN PRIMATE VISUAL CORTEX, THE GABOR REPRESENTATION, IN AN ATTEMPT TO DEVELOP AN EFFICIENT METHOD FOR EXTRACTING A DEPTH ARRAY VIA DISPARITY MAPPING BASED ON LOCAL SPATIAL AND LOCAL SPATIAL FREQUENCY ENCODING. THE SIGNIFICANCE OF THIS APPROACH IS THAT IT MODELS NOT A VISUAL SYSTEM, BUT RATHER AN EXPERIMENTALLY VERIFIED MODEL OF THE PRIMATE VISUAL SYSTEM. THIS IS CRITICAL TO THE EFFECTIVE APPLICATION OF HUMAN INFORMATION PROCESSING TECHNIQUES TO SPECIALIZED OR INTELLIGENT IMAGE PROCESSING SYSTEMS. TO MEET THE GOAL, THE RELEVANT INFORMATION CONTAINED IN FILTERED STEREO IMAGE PAIRS WILL BE EXAMINED TO DETERMINE OPTIMAL DISPARITY EXTRACTION ALGORITHMS ON THIS TYPE OF REPRESENTATION IN A TEST OF SYSTEM PERFORMANCE.

INDEPENDENT RISK ASSESSMENT INC
10221 SLATER AVE - STE 103-485
FOUNTAIN VALLEY, CA 92708
CONTRACT NUMBER:
DR WILLIAM H CRABTREE
TITLE:
INNOVATIVE TECHNOLOGIES/METHODOLOGIES TO REDUCE SPACE
TOPIC# 167 OFFICE: AFSTC/OL-AB

SUBMITTED BY

THE EXPERIENCE OF THE PAST THIRTY YEARS IN THE SPACE BUSINESS HAS YET TO BE FULLY EXPLOITED FOR ITS POTENTIAL IN REDUCING SPACE SYSTEMS COSTS. THE PROPOSED EFFORT WILL PROVIDE A METHODOLOGY WHICH WILL PLACE THE PAST EXPERIENCE OF COST REDUCTION INITIATIVES AT THE FINGERTIPS OF THE AIR FORCE MANAGERS. THE METHODOLOGY IS PLANNED TO TAKE THE FORM OF A TWO PART DECISION SUPPORT MODEL CODED FOR A PERSONAL COMPUTER. PART ONE WILL LEAD THE USER TO THE COST REDUCTION OPPORTUNITY WHICH IS MOST APPLICABLE TO THE CURRENT SITUATION. PART TWO WILL SUGGEST THE STEPS TO BE TAKEN AND THE HURDLES TO BE OVERCOME TO IMPLEMENT AN INITIATIVE. IN EACH CASE, THE MODEL WILL PROVIDE THE USER WITH CASE STUDIED THAT GIVE DETAILED RELEVANT EXPERIENCE. THE DEVELOPMENT OF THE MODEL WILL MAKE USE OF THE CURRENT STATE-OF-THE-ART IN EXPERT OR INTELLIGENT ADVISORY SYSTEMS. PHASE I WILL FOCUS ON THE DEVELOPMENT OF THE KNOWLEDGE BASE AND ITS REPRESENTATION IN THE MODEL BY UTILIZING KEY PERSONNEL WHO HAVE SIGNIFICANT PREVIOUS EXPERIENCE IN MANAGING AIR FORCE COST REDUCTION INITIATIVES. PHASE II WILL CONSIST OF COMPLETION OF THE DATA BASE AND MODEL STRUCTURE VERIFIED BY FINAL TESTING OF THE MODEL.

INNOVATIVE SYSTEMS
130 WING RD
RAMEY, PR 00604
CONTRACT NUMBER:
DR KENNETH C TURNER
TITLE:
A STUDY OF MECHANISMS PRODUCING ASTROPHYSICAL JETS
TOPIC# 192 OFFICE: AFRPL/TSTR

MECHANISMS EXIST IN NATURE CAPABLE OF ACCELERATING JETS OF MATTER TO VELOCITIES CLOSE TO THAT OF LIGHT, WITH GREAT ENERGY EFFICIENCY. THESE MECHANISMS ARE NOT PRESENTLY UNDERSTOOD, BUT ARE OBSERVED TO OCCUR BOTH IN THE CENTRAL REGIONS OF GALAXIES AND IN A FEW STARS IN OUR OWN GALAXY. THE EXISTANCE OF ASTROPHYSICAL JETS ON THESE TWO VERY DIFFERENT SCALES SUGGESTS THAT SOME COMMON MECHNISM MAY EXIST WHICH MIGHT BE SCALED DOWN EVEN FURTHER, PERHAPS EVEN TO LABORATORY SIZE. SUCH A DEVELOPMENT WOULD OFFER THE POSSIBILITY OF VERY HIGH SPECIFIC IMPULSE DEVICES FOR PROPULSION SYSTEMS OR DIRECTED ENERGY DEVICES.

INTEGRATED CRYSTAL SYSTEMS INC
6127 COWELL RD
BRIGHTON, MI 48116
CONTRACT NUMBER: F33615-87-C-2796
DR BRENTON L MATTES
TITLE:
CuCl:Si WIRE FOR ENERGY STORAGE AND CONDITIONING A POT TEMPERATURE SUPERCONDUCTOR
TOPIC# 125 OFFICE: AFWAL/PO

SUBMITTED BY

EXPITAXIAL CUPROUS CHLORIDE ON SILICON SUBSTRATES (CuCl:Si) EXHIBITS UNIQUE PHYSICAL PROPERTIES TO TEMPERATURES ABOVE 200 DEG C THAT, HERETOFORE, HAVE ONLY BEEN OBSERVED IN LOW TEMPERATURE SUPERCONDUCTING MATERIALS. THESE PROPERTIES APPEAR TO BE LOCALIZED AT THE INTERFACE BETWEEN THE CuCl LAYER AND Si SUBSTRATE. THE VERY LOW RESISTANCE STATE APPEARS TO EXHIBIT A CRITICAL CURRENT THAT MAY BE RELATED TO A SUPERCONDUCTING CRITICAL FIELD AND TEMPERATURE. THE OBJECTIVE OF THIS PROPOSAL IS TO DETERMINE THESE CRITICAL PARAMETERS FOR DIFFERENT SUBSTRATE ORIENTATIONS AND DOPANT CONCENTRATIONS, AND GROWTH CONDITIONS. THE RESULTS OF THIS RESEARCH WILL BE USED IN THE DEVELOPMENT OF A CuCl:Si "WIRE" USING Si FIBERS. THE GROWTH AND PHYSICAL PROPERTIES OF CuCl:Si ARE VERY REPRODUCIBLE AND STABLE, AND AMENABLE TO MASS PRODUCTION.

INTEGRATED SOFTWARE INC
BOX 060295
PALM BAY, FL 32906
CONTRACT NUMBER: F33615-87-C-1486
DR SAMUEL S HARBAUGH
TITLE:
PROCESSOR FOR ARTIFICIAL INTELLIGENCE/ADA APPLICATIONS
TOPIC# 141 OFFICE: AFWAL/AA

A PROJECT IS PROPOSED WHICH WILL INVESTIGATE THE REQUIREMENTS OF A 32-BIT MILITARIZED PROCESSING MODULE WITH AN INSTRUCTION SET ARCHITECTURE THAT WILL EFFICIENTLY PERFORM BOTH AI AND ADA-TYPE PROCESSING AND BE COMPATIBLE WITH APPLICABLE BACKPANEL BUS STANDARDS. THE PROPOSED PROJECT WILL RESEARCH CURRENTLY AVAILABLE MICROPROCESSORS WHOSE ARCHITECTURES LEND THEMSELVES TOWARD EXTENSIBILITY OF AI/ADA FEATURES THROUGH THE USE OF CUSTOM VLSI CHIPS. AFTER EXAMINING ARCHITECTURE, EXECUTION PARADIGMS, AND PRINCIPAL APPLICATIONS OF AI/ADA MACHINES, AN IMPLEMENTATION AND TEST PLAN WILL BE FORMULATED TO MEET FUNCTIONAL, EFFICIENCY, AND SYSTEM INTEROPERABILITY REQUIREMENTS.

INTELLIGENT SYSTEMS INTEGRATION INC
2120 FATHER SKY NE
ALBUQUERQUE, NM 87112
CONTRACT NUMBER: FQ8671-8701431
DR TIMOTHY J ROSS
TITLE:
DEVELOPMENT OF A NEW SEM INSTRUMENT FOR MEASURING SHOC IN BRITTLE MATERIALS
TOPIC# 241 OFFICE: AFOST/XOT

SUBMITTED BY

THE MECHANICAL PROPERTIES OF BRITTLE MATERIALS UNDER HIGH STRAIN RATE LOADINGS IS A MAJOR CONCERN TO THE AIR FORCE IN THEIR DEVELOPMENT OF LOW COST AND HIGHLY SURVIVABLE MATERIALS. THE ABILITY TO VIEW THE MICROSTRUCTURE EVOLUTION DURING SHOCK LOADING IS CRITICAL TO GAINING A BETTER UNDERSTANDING OF THE MATERIAL DUE TO RATE EFFECT. AT PRESENT NO DIAGNOSTIC INSTRUMENTATION IS AVAILABLE TO MAKE REAL-TIME MICROSCOPIC MEASUREMENTS IN THE MICROSECOND AND MILLISECOND TIME REGIMES. THE COMBINATION OF A SCANNING ELECTRON MICROSCOPE (SEM) AND A MAGNETIC SHOCK LOADING DEVICE SHOULD PROVIDE THE POTENTIAL FOR RECORDING SOME OF THE EVENTS RELATED TO SURFACE RESPONSE IN REAL TIME FOR MATERIALS UNDER HIGH STRAIN RATE LOADINGS.

INTELLIGENT SYSTEMS INTEGRATION INC
2120 FATHER SKY NE
ALBUQUERQUE, NM 87112
CONTRACT NUMBER:
DR TIMOTHY J ROSS
TITLE:
STOCHASTIC METHODS IN PROTECTIVE STRUCTURE DESIGN
TOPIC# 69 OFFICE: AFESC/RDXP

PROTECTIVE STRUCTURES DESIGNED TO WITHSTAND THE EFFECTS OF CONVENTIONAL (NONNUCLEAR) MUNITIONS ARE BUILT PRIMARY ACCORDING TO DETERMINISTIC DESIGN PROCEDURES. REAL-WORLD VARIABILITIES IN SITE CHARACTERISTICS, STRUCTURAL ATTRIBUTES LIKE STRENGTH AND STIFFNESS, AND WEAPON DELIVERY CHARACTERISTICS ARE GENERALLY NOT ACCOUNTED FOR IN CURRENT DESIGN SCHEMES. THIS PROPOSED EFFORT SEEKS TO DEVELOP MORE GENERALIZED DESIGN TOOLS WHICH; a) CAN TAKE INTO ACCOUNT THE NATURAL RANDOM VARIABILITY OF QUANTITATIVE DESIGN PARAMETERS, b) CAN ASSESS THE UNCERTAINTY IN NONRANDOM ISSUES SUCH AS MODELING AND BOUNDARY CONDITION ASSUMPTIONS, AND c) CAN ACCOMMODATE FLEXIBILITY IN MODELING STRUCTURE BEHAVIORAL CHANGES CAUSED BY EVOLUTIONS IN THE WEAPONS ENVIRONMENT.

INTERSPEC INC
1100 E HECTOR ST
CONSHOHOCKEN, PA 19428
CONTRACT NUMBER:
DR KENNETH ABEND
TITLE:
DISTRIBUTED ARRAY RADAR DEMONSTRATION
TOPIC# 40 OFFICE: RADC/XPX

SUBMITTED BY

THE OBJECTIVE IS TO FURTHER DEFINE AND SPECIFY A GROUND-BASED EXPERIMENT DESIGNED BY INTERSPEC, THAT WILL PROVE THAT A DISTRIBUTED ARRAY RADAR CAN OPERATE COHERENTLY ON TRANSMIT AS WELL AS RECEIVED WITH FULL TWO-WAY GAIN. COHERENT OPERATION ON RECEIVE HAS ALREADY BEEN DEMONSTRATED BY THE UNIVERSITY OF PENNSYLVANIA VALLEY FORGE RESEARCH CENTER (VFRC) AND INTERSPEC. THE EXPERIMENT TO BE DESIGNED WILL DEMONSTRATE FULL COHERENT RECEIVE GAIN IN A WIDELY DISTRIBUTED ARRAY, COHERING ON CLUTTER AND ON COLLECTIONS OF POOR PHASE SYNCHRONIZING SOURCES, FULL COHERENT TRANSMIT-RECEIVE GAIN, COMPARATIVE PERFORMANCE EVALUATION OF SELF-SURVEYING AND SELF-COHERING TECHNIQUES FOR TWO-WAY COHERENCE, SYSTEM SURVIVABILITY, REMOVAL OF SIDELOBE ARTIFACTS, ADAPTIVE SIDELOBECLUTTER CANCELLATION, AND ADAPTIVE JAMMER CANCELLATION. THE PROPOSED EXPERIMENTS REPRESENT THE CULMINATION OF TWELVE YEARS OF RESEARCH AND DEVELOPMENT OF TECHNIQUES FOR SYNCHRONIZING AND COHERING LARGE, DISTRIBUTED, PHASED ARRAY RADARS. A DISTRIBUTED SPARSE ARRAY REPRESENTS AN IDEAL WAY TO ELIMINATE SURFACE CLUTTER AND REDUCE CLUTTER DOPPLER SPREAD IN A SPACEBORNE OR AIRBORNE AIR DEFENSE RADAR.

INTERSPEC INC
1100 E HECTOR ST
CONSHOHOCKEN, PA 19428
CONTRACT NUMBER: F04701-87-C-0112
DR KENNETH ABEND
TITLE:
SYNCHRONIZING AND COHERING A DISTRIBUTED SPARSE ARRAY
TOPIC# 173 OFFICE: SD/SPO

THE OBJECTIVE IS TO ASSESS RADAR SYNCHRONIZATION AND COHERENCE TECHNIQUES FOR A DISTRIBUTED SPARSE ARRAY (DSA) OF SPACECRAFT. THE DSA REPRESENTS THE CULMINATION OF 12 YEARS OF RESEARCH ON THE SUBJECT OF COHERING HIGHLY THINNED, DISPERSED RADAR ARRAYS BY THE VALLEY FORGE RESEARCH CENTER (VFRC) AND A COMPANY CALLED INTERSPEC THAT GREW OUT OF THE VFRC. TO A LARGE EXTENT, THE SUBJECT OF THIS PROPOSAL IS INTERSPEC'S RAISON D'ETRE. MONOLITHIC AND DISTRIBUTED CANDIDATE SPACE BASED AIR DEFENSE RADAR SYSTEMS WILL BE ESTABLISHED AND A COMPUTER PROGRAM WILL BE WRITTEN TO EVALUATE COMPARATIVE PERFORMANCE. METHODS OF LOCATING THE MINIRADARS AND SYNCHRONIZING THEIR CLOCKS WILL BE CONSIDERED ALONG WITH METHODS OF DISTRIBUTING PHASES. TIMING

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AND POSITION NEED NOT BE KNOWN TO WITHIN A FRACTION OF A WAVELENGTH AS LONG AS PHASE COHERENCE CAN BE MAINTAINED. A LARGE NUMBER OF COHERING TECHNIQUES DEVELOPED BY VFRC AND INTERSPEC WILL BE ASSESSED IN TERMS OF PERFORMANCE, COMPLEXITY, AND OPERATIONAL SURVIVABILITY. IN ADDITION, A NOVEL MEANS TO NULL SIDELOBE CLUTTER IN A DISTRIBUTED ARRAY WILL BE ADDRESSED AND PROBLEMS OF RECONFIGURABILITY AND AREA COVERAGE RATE WILL BE ADDRESSED.

INTERSPEC INC
1100 E HECTOR ST
CONSHOHOCKEN, PA 19428
CONTRACT NUMBER: F04701-87-C-0113
BARRY FELL
TITLE:
ON-ORBIT RADAR COST BETWEEN A DISTRIBUTED SPARSE ARRAY MONOLITHIC SPACE BASED RADAR
TOPIC# 175 OFFICE: SD/SPO

A METHODOLOGY WILL BE DEVELOPED TO THAT CAPTURES THE IMPORTANT PRODUCTION, SUPPORT, TRANSPORT, AND OPERATING COSTS ASSOCIATED WITH MONOLITHIC AND DISTRIBUTED SPARCE ARRAY SPACE BASED RADAR. KEY COST DRIVERS OF THESE TWO APPROACHES TO SPACE BASED RADAR ARE IDENTIFIED AND PARAMETRIC COST MODELS SIMILAR TO THE EXISTING RCA PRICE PARAMETRIC COST MODEL ARE DEFINED IN PHASE I. PHASE II IMPLEMENTS THE NEW COST MODELS AND INTEGRATES THEM THROUGH A MASTER EXECUTIVE PROGRAM WITH EXISTING RCA PRICE COST MODELS.

INTERSPEC INC
1100 E HECTOR ST
CONSHOHOCKEN, PA 19428
CONTRACT NUMBER: F04701-87-C-0114
DR E HESHAM ATTIA
TITLE:
SIGNAL PROCESSING ARCHITECTURE FOR A DISTRIBUTED SPARS RADAR SYSTEM
TOPIC# 177 OFFICE: SD/SPO

WE PROPOSE TO DEVELOP A NOVEL SIGNAL PROCESSING ARCHITECTURE FOR THE

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DISTRIBUTED SPARSE ARRAY (DSA) RADAR. THE SYSTEM IS A SPACE-BASED, THINNED PHASED ARRAY RADAR IN WHICH EACH ARRAY ELEMENT IS A SEPARATE SPACECRAFT (CALLED A MINI-RADAR). MINI-RADARS COOPERATE TO FORM A SINGLE COHERENT RADAR BEAM. THE NEW ARCHITECTURE DISTRIBUTES SIGNAL PROCESSING ALMOST EQUALLY THROUGHOUT THE MINI-RADARS AND ALLOWS FOR PROCESSING RECONFIGURATION IN THE EVENT OF A SINGLE (OR EVEN MULTIPLE) MINI-RADAR FAILURE OR DESTRUCTION. THE KEY IDEA IS TO DISTRIBUTE ARRAY PROCESSING AMOND THE SPACECRFT ACCORDING TO RANGE OR DOPPLER SHIFT. THIS IS DONE BY DIVIDING THE TOTAL RANGE/DOPPLER INTERVAL COVERED INTO N EQUAL RANGE/SOPPLER SUBINTERVALS AND ASSIGNING EACH SUBINTERVAL TO ONE OF THE MINI-RADARS FOR PROCESSING. IN OTHER WORDS, EACH MINI-RADAR BECOMES THE CENTRAL PROCESSOR OR "MASTER" FOR A PARTICULIAR GROUP OF RANGE/DOPPLER BINS. RECONFIGUREABILITY OF PROCESSING IN THE EVENT OF A LOSS OF ONE OR MORE MINI-RADARS IS STRAIGHTFORWARD: DIVIDE THE TOTAL NUMER OF RANGE/DOPPLER BINS OF INTEREST EQUALLY AMONG THE SURVIVORS. WE SHOW THAT THIS PROCESSING STRATEGY REQUIRES A MINIMUM OF DATA STORAGE AND GOES HAND-IN HAND WITH STATE-OF-THE-ART SELF-COHERING, BEAM NULLING, AND CLUTTER REJECTION TECHNIQUES.

IRVINE TECHNOLOGY GP INC
26152 MT DIABLO RD
LAGUNA HILLS, CA 92653
CONTRACT NUMBER:
RONALD E OGLEVIE
TITLE:
AUTONOMOUS CONTROL SYSTEM FOR LOW-THRUST ORBITAL TRANS (OTV) FOR GLOBAL POSITIONING SYSTEM (GPS)
TOPIC# 172 OFFICE: SD/SPO

THE PROPOSED PROJECT WILL DEVELOP INNOVATIVE TECHNIQUES FOR LOW-COST CONTROL OF THE ATTITUDE AND ENGINE FIRING OF THE ELECTRIC ORBITAL TRANSFER VEHICLE (EOTV) DURING ITS SPIRAL ORBIT TRANSFER MISSION. THE EOTV PROMISES THE ABILITY TO DELIVER GPS REPLENISHMENT SATELLITES TO THEIR OPERATIONAL ORBITS AT SIGNIFICANT COST SAVINGS OVER CONVENTIONAL CHEMICAL UPPER STAGES. THE PROPOSED APPROACH WILL USE THE ITG LOWTOP TRAJECTORY OPTIMIZATION PROGRAM TO DEVELOP TRADEOFF DATA FOR ORBIT TRANSFER. EFFECTS OF ECLIPSING, MANEUVER TORQUE (FOR RE-ORIENTING SOLAR ARRAYS), AND ORBIT CHARACTERISTICS ON DELTA-V AND

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ORBIT TRANSFER TIME WILL BE CALCULATED. OPTIMAL GUIDANCE LAWS WILL BE DEVELOPED FROM THIS IN ORDER TO FIND WORST-CASE REQUIREMENTS ON THE CONTROL SYSTEM. SUB-OPTIMAL GUIDANCE LAWS WILL ALSO BE DEVELOPED AS NEEDED TO PERMIT TRADEOFFS TO BE MADE OF DELTA-V AND TRANSFER TIME VS. CONTROL SYSTEM MASS AND CONFIGURATION TO ARRIVE AT LOWEST LIFE-CYCLE COST. A CONCEPTUAL CONTROL SYSTEM DESIGN WILL BE MADE AFTER TRADING OFF CANDIDATE SENSORS, COMPUTER RESOURCES, EFFECTORS, AND GROUND OPERATIONAL REQUIREMENTS. AUTONOMOUS AND CONTINUOUS CONTROL WILL BE MAJOR CRITERIA FOR SELECTING THE BEST CANDIDATES.

KETRON INC
350 TECHNOLOGY DR - STE 20
MALVERN, PA 19355
CONTRACT NUMBER:
ELI RUBINSTEIN
TITLE:
COMPOSITE MATERIALS FOR MANIKIN SKELETAL COMPONENTS KP
TOPIC# 87 OFFICE: AMD/RDO

MANIKINS USED IN CRASH/IMPACT TESTS AND IN THE TESTING OF ESCAPE SYSTEMS AND RESTRAINT DEVICES REQUIRE STRUCTURAL STRENGTH ADEQUATE TO REPEATEDLY WITHSTAND THE HIGH LOADS IMPOSED UPON THEM BY VARIOUS DYNAMIC TEST CONDITIONS. THE USE OF METAL-BONDED SKELETONS TO ACHIEVE THE REQUISITE STRENGTH SIGNIFICANTLY INCREASES THE DIFFICULTY OF PROVIDING THE MASS DISTRIBUTION AND LOAD DEFORMATION CHARACTER-ISTICS NEEDED TO OBTAIN GOOD BIOFIDELIC RESPONSE DURING TESTS. AS TEST ENVIRONMENTS BECOME MORE SEVERE, MANIKIN STRENGTH REQUIREMENTS TEND TO INCREASE AND ADEQUATE MANIKIN BIOFIDELITY BECOMES MORE CRITICAL AND MORE DIFFICULT TO ACHIEVE. THIS DOCUMENT PRESENTS A PHASE I PROPOSAL FOR A PROJECT TO DEMONSTRATE THE FEASIBILITY OF IMPROVING THE BIOFIDELITY OF A MODERN MANIKIN SUCH AS HYBRID III BY REPLACING THE EXISTING METAL BONES WITH STRONGER, LIGHTER WEIGHT COMPOSITE MATERIAL STRUCTURAL MEMBERS WHICH INCORPORATE APPROPRIATE BALLASTING FEATURES.

KLEIN ASSOCS INC
PO BOX 264
YELLOW SPRINGS, OH 45387
CONTRACT NUMBER: F33615-87-C-5300
DR GARY A KLEIN
TITLE:
A CASE-BASED EXPERT SYSTEM FOR MANUFACTURING APPLICATI
TOPIC# 108 OFFICE: AFWAL/ML

SUBMITTED BY

THE OBJECTIVE IS TO DEVELOP ARTIFICIAL INTELLIGENCE (AI) FOR INCREASING MANUFACTURING CAPABILITIES. A CASE-BASED REASONING (CBR) APPROACH TO KNOWLEDGE ELICITATION IS PROPOSED AS A SENSITIVE AND EFFECTIVE STRATEGY TO DERIVE AND REPRESENT THE CRITICAL KNOWLEDGE. PHASE I WILL DEMONSTRATE THE FEASIBILITY OF USING A CBR APPROACH TO DEVELOPING AN AI KNOWLDGE-BASED SYSTEM TO IMPROVE MANUFACTURING. CASE-BASED REASONING METHODS WERE DEVELOPED FOR DOMAINS WHERE DIRECT DATA COLLECTION WAS TIME-CONSUMING, EXPENSIVE, AND OFTEN NOT FEASIBLE, AND WHERE FORMAL MODELS WERE HARD TO APPLY BECAUSE OF MISSING DATA AS WELL AS THE COMPLEXITY OF THE PROBLEM. CBR RELIES UPON ESTRAPOLATION FROM EXISTING POINTS; IT CAN OVERCOME PROBLEMS OF MISSING DATA WHILE LEAVING A CLEAR RATIONAL FOR THE BASIS OF THE ESTIMATES GENERATED. THEREFORE, A CBR APPROACH WOULD HAVE THE ADVANTAGE OF OVERCOMING THE LIMITATIONS OF ALTERNATIVE KNOWLEDGE-ENGINEERING APPROACHES WHILE INCREASING THE EFFECTIVENESS OF KNOWLEDGE-BASED SYSTEMS.

KLM TECHNOLOGIES INC
2700 YGNACIO VALLEY RD - #160
WALNUT CREEK, CA 94598
CONTRACT NUMBER:
B GEORGE KNIAZEWYCZ
TITLE:
DEVELOPMENT OF ROBOTICS APPLICATIONS IN A SOLID PROPEL MIXING LABORATORY
TOPIC# 189 OFFICE: AFRPL/TSTR

TO FURTHER SUPPORT EVOLUTION OF ROBOTIC TECHNOLOGY INTO THE LABORATORIES, THE U.S. AIR FORCE HAS IDENTIFIED THE NEED TO IMPROVE RESEARCH TO PERMIT OPTIMUM USES OF RECENTLY INTRODUCED ROBOTIC SYSTEMS. KLM TECHNOLOGIES, INC., (KLM) HAS SPENT THE PAST FEW YEARS IN REVIEWING, ANALYZING AND APPLYING ROBOTIC TECHNOLOGIES AS THEY APPLIED TO THE HAZARDOUS ENVIRONMENTS; IDENTIFYING THE CAPABILITIES AND LIMITATIONS OF THE TECHNOLOGY AGAINST AN ASSESSMENT OF POTENTIAL LABORATORY APPLICATIONS; IDENTIFYING A POTENTIAL CLASS OF ACTIVITIES FOR FURTHER STUDY AND ON-SITE TESTING; AND, INITIATING TEST AND EVALUATION PROGRAMS TO SUPPORT THE ENTREE OF THE TECHNOLOGY INTO AN OPERATING LABORATORY ENVIRONMENT. IN 1986 KLM WAS AWARDED A CONTRACT BY A MAJOR AEROSPACE COMPANY (MORTON THIOKOL, INC.) TO DESIGN, FABRICATE AND INSTALL A ROBOTIC LABORATORY AUTOMATION SYSTEM FOR ROCKET

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PROPELLANT POT LIFE MEASUREMENT. THIS PROJECT PRESENTS ONE OF THE FIRST USES OF ROBOTIC IN PROPELLANT MANUFACTURING AND TESTING. KLM IS PROPOSING A TWO PHASE PROGRAM TO BUILD UPON THIS PRACTICAL EXPERIENCE BASE TO SUBSTANTIALLY EXPAND THE USE OF ROBOTICS BY EXPLORING AND IMPLEMENTING A DEVELOPMENT PROGRAM TO INCREASE THE POTENTIAL USEFUL WORK A ROBOTIC SYSTEM CAN PERFORM SUCCESSFULLY IN A LABORATORY ENVIRONMENT. THE MULTIPHASE PROGRAM IS DESIGNED TO ADDRESS THE APPLICATION OF ROBOTIC TECHNOLOGY AND OTHER AUTOMATED PROCESSING TECHNIQUES AS A MEANS OF REDUCING COST AND IMPROVING THE SAFETY OF THESE OPERATIONS. SPECIAL EMPHASIS IS PLACED ON THE UTILIZATION OF EITHER FIXED OR LINEAR TRACKED TABLE TOP ROBOTS TO ASSIST IN INGREDIENT WEIGHING AND PROBABILITY, INGREDIENT ADDITION, ON-LINE MONITORING OF RELEVANT MIX PARAMETERS, PROPELLANT CASTING, CLEAN-UP AND TESTING.

KNOWLEDGE SYSTEMS CONCEPTS INC
262 LIBERTY PLAZA
ROME, NY 13440
CONTRACT NUMBER:
DR JOHN F LEMMER
TITLE:
APPLICATION OF MODERN MATHEMATICS TO THEATRE AIR WARFA
INTELLIGENCE
TOPIC# 64 OFFICE: RADC/XPX

THE OPPORTUNITY ADDRESSED HERE IS TO QUANTIFY THE UNCERTAINTY ASPECTS OF INDICATIONS & WARNING, SITUATION ASSESSMENT, AND PREDICTION, IN A UNIFORM AND CONCEPTUALLY SIMPLE, MATHEMATICAL MODEL WHICH ALSO SUPPORTS DECISION MAKING ASPECTS OF COLLECTION MANAGEMENT. THE MATHEMATICS NEATLY FIT THE CASUAL MODEL OF INTELLIGENCE RECENTLY PROPOSED BY THE CIA AND IS BASED ON A STRAIGHTFORWARD GENERALIZATION OF BAYSEAN INFERENCE. IN THE PAST SEVERAL YEARS PROBABILILTIES HAVE REGAINED RESPECTABILITY AS A TECHNIQUE FOR INTELLIGENT SYSTEMS. NEW RESEARCH RESULTS INDICATE THAT BAYSEAN TECHNIQUES ARE NOW BOTH FEASIBLE AND APPROPRIATE FOR INTELLIGENCE WORK. THE THRUST OF THE EFFORT PROPOSED HERE IS TO CONFIRM THE HYPOTHESIS THAT BAYSEAN TECHNIQUES ARE NOW BOTH APPROPRIATE AND PRACTICAL AND ALSO POINT THE WAY FOR APPLICATION OF THESE TECHNIQUES TO REALISTIC THEATER WARFARE INTELLIGENCE PROBLEMS.

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KNOWLEX TECHNOLOGY CORP
301 DEXTER ST
DENVER, CO 80220
CONTRACT NUMBER:
JAN PETERSON
TITLE:
DISTRIBUTED COMPUTING DESIGN SYSTEM DESCRIPTION DATABA
TOPIC# 51 OFFICE: RADC/XPX

OUR OVERALL GOAL IS TO COMMERCIALIZE THE DISTRIBUTED COMPUTING DESIGN SYSTEM (DCDS) METHODOLOGY (PREVIOUSLY DEVELOPED BY TRW FOR THE US.S. ARMY BMDATC). DCDS SUPERSEDES CURRENT METHODS WITH REQUIREMENTS-TO-CODE SUPPORT FOR REAL TIME DISTRIBUTED SYSTEMS. THE SYSTEM DESCRIPTION DATABASE (SDD) IMPLEMENTS AN UNDERLYING REPRESENTATION BASED ON ELEMENT RELATIONSHIP ATTRIBUTE AND GRAPH MODEL OF COMPUTATION PRINCIPLES. OUR PHASE I OBJECTIVES FOCUS ON THE PROTOTYPE DEVELOPMENT OF A SDD DATABASE WHICH CONTAINS THE COMPOSITION OF SYSTEM AND SOFTWARE ELEMENTS, THEIR RELATIONSHPS, AND ATTRIBUTES (SUCH AS UDF COVERSHEET, SOFTWARE MODULE METRICS, INPUT/OUTPUT DEFINITIONS, TRACEABILITY POINTERS, ETC.). INTERNAL DATA STRUCTURES PROVIDE REPRESENTATIONS THAT PERMIT GENERATION OF GANE & SARSON, YOURDON, STATE TRANSITION, N-SQUARED, AND HIERARCHY CHART DIAGRAMS. SDD SUPPORT SYSTEMS AND SOFTWARE ENGINEERING BY PROVIDING: COMPUTER SOFTWARE CONFIGURATION ITEM (CSCI) DOCUMENTATION, CHANGE TRACKING MECHANISMS EMBEDDED IN THE DATA STRUCTURES, MAINTENANCE OF SOURCE REQUIREMENTS, AND SUPPORT FOR THE FIVE INTERLOCKING SPECIFICATION LANGUAGES COMPRISING THE DCDS METHODOLOGY.

KUIPERS & ASSOCS
3085 BAKER PARK DR SE
GRAND RAPIDS, MI 49508
CONTRACT NUMBER:
JACK KUIPERS
TITLE:
CHARACTERIZATION AND APPLICATION OF QUATERNIONS FOR EN
COMPUTER PROCESSING ALGORITHMS
TOPIC# 81 OFFICE: AMD/RDO

SUBMITTED BY

THE QUATERNION OPERATOR HAS LONG BEEN REGARDED AS AN EFFICIENT ROTATION OPERATOR BUT ONE THAT IS NOT WELL KNOWN IN THE PRACTICING AEROSPACE ENGINEERING COMMUNITY. SO, FIRST WE METRICIZE 'HOW MUCH BETTER' THE QUATERNION OPERATOR ACTUALLY IS FOR A VARIETY OF APPLICATIONS. THEN, A PLAN FOR RIGOROUSLY INTRODUCING QUATERNION ALGEBRA AND QUATERNION CALCULUS IS PRESENTED. THIS PLAN EXPLOITS THE INTRINSIC GEOMETRIC PROPERTIES OF THE QUATERNION OPERATOR IN ORDER TO ACHIEVE AN ENGAGING 'DO-IT-YOURSELF' PEDAGOGY. LIBERAL USE OF PICTORIAL REPRESENTATIONS OF THIS GEOMETRY AND ALSO OF THE VARIOUS APPLICATIONS WILL APPEAL TO THE INTUITION AND HENCE MAKE THE QUATERNION OPERATOR EASIER TO UNDERSTAND AND MORE READILY ACCESSIBLE TO ALL PRACTITIONERS.

LASER PHOTONICS INC
12351 RESEARCH PKWY
ORLANDO, FL 32826
CONTRACT NUMBER:
R E McKINNEY
TITLE:
TUNABLE EYE-SAFE SOLID-STATE LASER SOURCES (1.5 - 2 MI
A NEW CRYSTAL: BETA-BARIUM-BORATE
TOPIC# 181 OFFICE: AFGL/XOP

NO ABSTRACT AT THIS TIME.

LASERCOM INC
8917 FULLBRIGHT AVE
CHATSWORTH, CA 91311
CONTRACT NUMBER:
DR SHLOMO MARGALIT
TITLE:
ULTRA NARROW LINEWIDTH OPTICAL SOURCE
TOPIC# 55 OFFICE: RADC/XPX

THIS PROPOSAL DESCRIBES AN EFFORT TOWARDS DEVELOPING AN OPTICAL SOURCE THAT WILL BE USEFUL IN PHOTONIC SYSTEMS. THIS SOURCE SUBSYSTEM IS BASED ON A SEMICONDUCTOR INJECTION LASER THAT IS PLACED IN A SPECIFICALLY DESIGNED EXTERNAL CAVITY. THE LENGTH OF THE EXTERNAL

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CAVITY IS 1.5 cm, CORRESPONDING TO A ROUND TRIP TIME OF 100 ps. THIS MAKES IT POSSIBLE TO DIRECTLY MODULATE THE LASER AT RATES OF UP TO SEVERAL GHz WITHOUT ADVERSE EFFECTS DUE TO MODE-LOCKING. EXPECTED LINEWIDTH OF THE SOURCE IS LESS THAN 50 KHz. IN ORDER TO ASSURE STABLE OPERATION AND ELIMINATE THE SUSCEPTIBILITY OF THE SOURCE TO SPURIOUS REFLECTIONS, MECHANICAL VIBRATIONS AND THERMAL VARIATIONS, THE LASER CHIP FACET FACING THE EXTERNAL CAVITY IS ANTI-REFLECTION COATED, AND ALL THE COMPONENTS COMPRISING THE SOURCE SUB-SYSTEM (LASER CHIP, LENS, WAVELENGTH SELECTIVE ELEMENT, AND MIRROR) ARE PERMANENTLY CLAMPED ONTO A SINGLE RIGID PACKAGE-ELEMENT.

LASERTRON INC
37 NORTH AVE
BURLINGTON, MA 01803
CONTRACT NUMBER:
R J PLASTOW
TITLE:
RELIABLE MICROWAVE LASER DIODE
TOPIC# 57 OFFICE: RADC/XPX

THE OBJECTIVE OF THE PROGRAM IS TO COMBINE THE HIGH RELIABILITY, STABLE, LASER AND PACKAGING TECHNOLOGY DEVELOPED FOR TELECOMMUNICATIONS APPLICATIONS WITH THE HIGH FREQUENCY (20 GHz) WAFER CHIP DESIGN AND PACKAGING REQUIRED FOR ANALOG MICROWAVE FREQUENCY APPLICATIONS. WE WILL I) DESIGN AND HAVE MADE MASKS FOR PRODUCTION OF SHORT CAVITY RESTRICTED AREA CONTACT LASER. ii) GROW, PROCESS MOUNT AND BOND DEVICES FROM TWO WAFERS USING THE ABOVE MASKS. iii) MEASURE THE CAPACITANCE AND SWEPT FREQUENCY RESPONSE OF THESE DEVICES. iv) ANALYZE PREVIOUS LIFETEST DATA TO DETERMINE EFFECT OF HIGH POWER OPERATION ON RELIABILITY. MOUNT, BOND, BURN IN, AND EVALUATE 1000 HOUR, 80 DEG C OPERATION OF SHORT CAVITY RESTRICED AREA LASERS DESCRIBED ABOVE. v) CONSTRUCT A PROTOTYPE BREADBOARD MODULE INCORPORATING MICROWAVE STRIPLINE AND LASER WELDING OF THE FIBER, AND CHARACTERIZE THE SWEPT FREQUENCY PERFORMANCE OF THIS MODULE. vi) INCORPORATE 35um DETECTOR IN THE LASERTRON UHS (ULTRA-HIGH-SPEED) DETECTOR MODULE. THE OVERALL RESULT OF THIS PHASE I EFFORT WILL BE CONFIRMATION THAT THE PRESENT COMMERCIAL ... LASER MANUFACTURED BY LASERTRON IN VOLUMES EXCEEDING 1000/WEEK TO STRINGENT RELIABILITY REQUIREMENTS CAN BE ADAPTED FOR USE AT 20 GHz, AND THAT THE HIGH

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STABILITY LASER WELDED PACKAGING DEVELOPED FOR TELECOMMUNICATION APPLICATIONS CAN BE MODIFIED TO ACCEPT MICROWAVE STRIPLINE COMPONENTS.

LICA SYSTEMS INC
10400 EATON PL - STE 100
FAIRFAX, VA 22030
CONTRACT NUMBER: F33615-87-C-1469
ROBERT K COFOD
TITLE:
ADAPTIVE COMMUNICATIONS EXCHANGE SYSTEM (ACES)
TOPIC# 156 OFFICE: AFWAL/AA

ACES IS AN INTEGRATED CONTROL SYSTEM WHICH USES CONVENTIONAL AND ARTIFICIAL INTELLIGENCE TECHNIQUES FOR AUTOMATED ASSISTANCE TO THE OPTIMIZATION OF AIR COMBAT COMMUNICATIONS CAPABILITIES. ACES CONTROLLERS ARE ELEMENTS OF EACH COMBAT WEAPONS AND C2 ENVIRONMENTS NODE WHICH CAN SENSE BOTH THE ELECTROMAGNETIC ENVIRONMENT AND THE QUALITATIVE DEMANDS FOR COMMUNICATIONS AT NODES AND WITHIN NETWORKS. ACES TAKES ADVANTAGE OF ADVANCES IN ADAPTIVE COMMUNICATIONS TECHNOLOGIES AND THROUGH AN EXPERT SYSTEM'S "COMMUNICATOR'S AGENT" ASSISTS IN BALANCING THE REQUIRED THROUGHPUT OF COM NICATIONS AGAINST THE AVAILABLE BANDWIDTH. THE UNIQUENESS OF ACES IS IN ITS ABILITY TO "KNOW" ABOUT BOTH THE COMMUNICATIONS ENVIRONMENT AND THE COMBAT SITUATIONAL ENVIRONMENT SIMULTANEOUSL THE INTERACTION OF THESE DOMAINS IS SEEN AS A HIGHLY ADVANCED APPROACH TO MATCHING THE ESSENTIAL FLOW OF INFORMATION WITH THE AVAILABLE COMMUNICATIONS.

LIGHT FANTASTIC INC
PO BOX 1231
OAK RIDGE, TN 37831
CONTRACT NUMBER: F33615-88-C-1719
HERBERT INHABER
TITLE:
REAL-TIME HOLOGR HY COCKPIT DISPLAY
TOPIC# 149 OFFICE: AFWAL/

THE ABILITY TO SEE THREE-DIMENSIONAL IMAGES IN CONVEYED BY ONLY A FEW TECHNOLOGIES. HOLOGRAPHY IS ONE. THIS PROPOSAL IS FOR A DYNAMIC

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(RECORDER OR REAL-TIME) MULTIPLEXED HOLOGRAPHIC SYSTEM IN WHICH A REMOTE LARGE-SCALE OBJECT OR SCENE-AIRCRAFT, TERRAIN OR OTHER - IS DISPLAY IN REAL TIME BY MEANS OF HOLOGRAPHY. THE MECHANISM USED IS HIGH-SPEED VIDEO RECORDING, COMBINED WITH COMPUTER AND OPTICAL TRANSFORMATION INTO MULTIPLEXTED HOLOGRAMS WHICH ARE SHOWN SEQUENTIALLY ON A SCREEN OR OTHER DEVICE. THE SYSTEM WOULD PERMIT, FOR THE FIRST TIME, REAL-TIME DISPLAY IN THREE DIMENSIONS WITHOUT THE USE OF THE HUMAN EYE. ADVANCES IN PARALLEL COMPUTER ARCHITECTURE AND IMAGE PROCESSING HAVE MADE POSSIBLE REAL-TIME HOLOGRAPHY, WHICH SEEMED UNATTAINABLE A FEW YEARS AGO. REAL-TIME HOLOGRAPHY WOULD ALLOW, IN PRINCIPLE, DISCARDING OF THE RELATIVELY FRAGILE CANOPY OF AIRCRAFT, AND COMPLETE REDEISGN OF FUTURE AIRCRAFT. THE PROPOSAL IS FOR A "TEST-BED" FOR DETERMINING THE APPROPIRATE RESEARCH AVENUES TO ACHIEVE THESE OBJECTIVES. MUCH OF THE PROPOSED EFFORT CONSISTS OF EVALUATING HOW PRESENT-DAY TECHNOLOGY IN ADVANCED COMPUTERS, ELECTRO-OPTIC MODULATORS, HOLOGRAPHY, LASERS AND OTHER FIELDS CAN BE COMBINED TO ATTAIN THE GOAL.

LIGHTWAVE ELECTRONICS CORP
897-5A INDEPENDENCE AVE
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER:
DR THOMAS J KANE
TITLE:
DIODE-PUMPED EYE-SAFE COHERENT LASER TRANSMITTER
TOPIC# 181 OFFICE: AFGL/XOP

IN THE PROPOSED RESEARCH LIGHTWAVE ELECTRONICS CORPORATION WILL DEVELOP HIGHLY COHERENT DIODE-PUMPED LASERS OPERATING AT THE EYE-SAFE WAVELENGTH OF 2.1 MICRONS. THE MOST PROMISING CLASS OF SOLID-STATE LASER MATERIALS MEETING THE REQUIREMENTS FOR BOTH DIODE-PUMPING AND EYE SAFETY ARE THE THULIUM:HOLMIUM:GARNETS, WHICH CAN BE PUMPED AT 0.78 MICRONS AND LASE AT 2.1 MICRONS. THESE MATERIALS HAVE A VERY LONG ENERGY STORAGE TIME OF 10 MSEC AND HAVE A THEORETICAL ENERGY EFFICIENCY OF 75%. IN PHASE I WE WILL DESIGN AND BUILD A DIODE-PUMPED Tm:Ho;GARNET SINGLE-MODE OSCILLATOR USING THE ULTRA-STABLE MONOLITHIC RING GEOMETRY, AND DESIGN A DIODE-PUMPED PULSED AMPLIFIER. IN PHASE II WE WILL BUILD A DIODE-PUMPED AMPLIFIER USING THE SAME MATERIALS.

SUBMITTED BY

LIGHTWAVE ELECTRONICS CORP
897-5A INDEPENDENCE AVE
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER: F33615-87-0C-1492
DR RICHARD W WALLACE
TITLE:
ELECTRO-OPTIC PROBES FOR ON-WAFER TESTING OF GaAs MMIC
TOPIC# 140 OFFICE: AFWAL/AA

IN THE PROPOSED RESEARCH, LIGHTWAVE ELECTRONICS WILL INVESTIGATE MAKING SEPARATE OFF-SUBSTRATE MICROPROBES FOR GALLIUM ARSENIDE (GaAs) MONOLITHIC MICROWAVE INTEGRATED CIRCUITS (MMICs) BASED UPON THE ELECTRO-OPTIC SAMPLING TECHNIQUE. THESE PROBES WILL BE OF A SUFFICIENTLY SMALL SIZE SO THAT WHEN THEY ARE PLACED NEXT TO OR IN CONTACT WITH THE CIRCUIT OR DEVICE TO BE TESTED THEY WOULD NOT LOAD OR PERTURB IT. THIS TECHNIQUE MEASURES BOTH THE MAGNITUDE AND PHASE OF VOLTAGE WAVEFORMS AT PRECISE POINTS WITHIN THE MMICs, BUT IT DOES NOT REQUIRE POLISHED SURFACES OR A CLEAR OPTICAL PATH INTO THE DEVICE SUBSTRATE AT THE MEASUREMENT POINT AS IS THE CASE WHEN PROBING DIRECTLY IN THE SEMICONDUCTOR SUBSTRATE.

LINGUISTIC RESEARCH INSTITUTE
5600 ARAPAHOE AVE - STE 206
BOULDER, CO 80303
CONTRACT NUMBER:
DR PETER G OSSORIO
TITLE:
A KNOWLEDGE DICTIONARY SYSTEM
TOPIC# 52 OFFICE: RADC/XPX

LRI IS PRESENTLY DEVELOPING AN EXPERT SYSTEM PROTOTYPE THAT APPLIES PART-WHOLE INFERENCE TO CONVENTIONAL ORDER-OF-BATTLE FILES. A KEY ELEMENT OF THIS PROJECT YET TO BE CONSIDERED IS AN INTEGRATED KNOWLEDGE DICTIONARY THAT WOULD (a) HELP THE ANALYST TO BETTER UNDERSTAND THE KNOWLEDGE BASE AND ITS RELATIONSHIP TO THE OB DATA, (b) PERMIT THE ANALYST TO DEVELOP AND MAINTAIN HIS OWN KNOWLEDGE BASES WITHOUT THE ASSISTANCE OF A KNOWLEDGE ENGINEER, AND (c) ALLOW PROGRAMMERS

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TO DESIGN AND IMPLEMENT ADDITIONAL INFERENCE ENGINES USING A STANDARDIZED INTERFACE TO THE DATA AND KNOWLEDGE BASE. THIS PHASE I EFFORT WOULD IDENTIFY THE CONTENT AND FUNCTIONALITY REQUIRED OF SUCH A DICTIONARY BY MEANS OF "HANDS ON" EXPERIMENTATION WITH THE PROTOTYPE SYSTEM BEING DEVELOPED.

MACHINE DESIGN ENGINEERS INC
714 S HOMER ST
SEATTLE, WA 98108
CONTRACT NUMBER:
LAVERNE D GOODWIN
TITLE:
EGRESS MACHINE CUTTER DEVELOPMENT
TOPIC# 209 OFFICE: BMO/MYSC

THE NEED EXISTS FOR AN ADVANCEMENT IN TUNNELING MACHINE CUTTER TECHNOLOGY TO INCREASE PENETRATION RATE OF TUNNELERS. THIS IS PARTICULARLY TRUE FOR CUTTERS MOUNTED ON A MACHINE INTENDED TO BE USED ON A EGRESS MACHINE FOR A MISSILE DEEP BASE. PHASE I OF THIS CONTRACT WILL PROVE FEASIBILITY OF AN INNOVATIVE CUTTER DEVELOPMENT AND TEST PROGRAM WHICH WILL INCLUDE NEW BEARING, SEAL AND CUTTER RING DESIGN CONCEPTS. AN ANALYTIC INVESTIGATION OF THE RELATIONSHIP BETWEEN SHIZE/SHAPE/SPEED OF THE CUTTER AND ITS CUTTING EFFICIENCY WILL BE PERFORMED. THERE IS REASON TO BELIEVE THAT A WIDESPREAD VIEW CONCERNING CERTAIN CUTTER CONFIGURATIONS MAY BE IN ERROR. THE PHASE I WORK WILL INCLUDE ANALYSIS, DESIGN RESEARCH, CONCEPT DEFINITION AND SELECTION AND PHASE II RECOMMENDATIONS. THE KEY PERSONNEL TO BE INVOLVED IN THIS PROJECT HAVE MANY YEARS OF TUNNELING AND MINING EXPERIENCE. THIS EXPERIENCE INCLUDES CUTTER DESIGN AND TESTING, JOB SITE TROUBLE SHOOTING AND PRODUCT RESPONSIBILITY FOR MAJOR TUNNELING COMPANIES.

MAINSTREAM ENGINEERING CORP
6191 ANCHOR LN
ROCKLEDGE, FL 32955
CONTRACT NUMBER: F33615-87-C-2797
ROBERT P SCARINGE
TITLE:
DEVELOPMENT OF GENERAL HEAT PUMP HEAT PIPE AND RANKINE COMPONENTS FOR SPACECRAFT HEAT REJECTION SYSTEMS
TOPIC# 124 OFFICE: AFWAL/PO

SUBMITTED BY

FUTURE MILITARY SPACE MISSIONS WILL INTRODUCE SIGNIFICANT NEW TECHNOLOGICAL NEEDS FOR SPACECRAFT ENERGY SYSTEMS. VARIOUS TECHNOLOGIES NEED TO BE EVALUATED TO DETERMINE THE BEST TECHNOLOGY FOR A PARTICULAR APPLICATION. A DESIGN TOOL THAT ALLOWS RAPID BUT ACCURATE COMPARISON OF ALL ALTERNATIVES WOULD BE EXTREMELY USEFUL. THE INTENT OF THIS PROPOSAL IS TO EXTEND THE GENERALIZED SIM TOOL TRANSIENT MODELING CAPABILITY INTO HEAT PUMP, HEAT PIPE AND RANKINE HEAT ENGINE COMPONENTS, TO ENHANCE THE PREDICTION OF SPACECRAFT TWO-PHASE THERMAL MANAGEMENT DESIGN ALTERNATIVES, ENHANCE THE PREDICTION OF COMPONENT FAILURES, AND ENHANCE THE PREDICTION OF SPACECRAFT SYSTEM SURVIVABILITY AND MAINTAINABILITY. TWO-PHASE FLUID PROPERTIES FROM THE LITERATURE WILL BE USED TO CREATE ALGORITHMS FOR SATURATED AND SUPERHEATED PROPERTIES OF R113 AND R114. IN ADDITION, THE MODIFIED REDLICH WONG EQUATION OF STATE WILL BE USED TO DEVELOP THERMODYNAMIC MODELS FOR NON-AZEOTROPE BINARY MIXTURES OF R11, R113, AND R114.

MAN LABS INC
21 ERIE ST
CAMBRIDGE, MA 02139
CONTRACT NUMBER:
EDWARD P WAREKOIS
TITLE:
CHARACTERIZATION OF ULTRASTRUCTURES IN REFRACTORY COMP DEPOSITION
TOPIC# 48 OFFICE: RADC/XPX

THE PROJECT WILL DETERMINE THE CRYSTALLOGRAPHIC, COMPOSITIONAL AND STRUCTURAL PROPERTIES OF ULTRASTRUCTURES OR STRAINED LAYER SUPERLATTICES PRODUCED BY THE CVD DEPOSITION OF REFRACTORY METALS AND COMPOUNDS. SEM/EDAX METHODS PLUS X-RAY DIFFRACTION TECHNIQUES WILL BE USED FOR THE INVESTIGATIONS. BEND AND TENSILE TESTS PLUS MICROHARDNESS PROFILES WILL BE EMPLOYED TO DETERMINE THE STRUCTURAL INTEGRITY OF THE LAYERED STRUCTURES AND STRENGTH OF THE INTERLAYER BONDING AND MECHANICAL PROPERTIES OF THE MATRIX MATERIALS. THERMODYNAMIC MODELS AND CALCULATIONS WILL BE APPLIED TO REFINE AND OPTIMIZE THE EXPERIMENTAL PARAMETERS USED IN THE SYNTHESIS OF THESE ULTRASTRUCTURES. THE PROJECT WILL INVESTIGATE STRUCTURES IN THE (Nb-NbN) AND (W-WC)SYSTEMS.

MARBLE ASSOCS INC
200 N GREAT RD
LINCOLN, MA 01773
CONTRACT NUMBER: F33615-87-C-3405
PAUL JURY
TITLE:
AUTONOMOUS MOBILE ROBOT SIMULATION
TOPIC# 115 OFFICE: AFWAL/FI

SUBMITTED BY

MARBLE ASSOCIATES, INC., PROPOSES TO BUILD A SOPHISTICATED, MODULARIZED SIMULATION OF A COMPLETE AUTONOMOUS, MULTIPLE HETEROGENEOUS SENSOR BASED, MOBILE ROBOTIC PLATFORM. PLUG-IN MODULES INCLUDE THE USER INTERFACE, THE PLATFORM ITSELF, THE SENSOR INTERFACE, THE STRATEGIC CONTROL CENTER, AND THE VARIOUS ALGORITHMS AND HURISTICS RESPONSIBLE FOR PATH PLANNING, ENVIRONMENT MAPPING, AND AUTONOMOUS NAVIGATION. A USER OF THE SIMULATOR WILL BE ABLE TO QUICKLY AND EFFICIENTLY TEST HIS ALGORITHMS ON THE DATA AVAILABLE FROM OFF-THE-SHELF SENSOR DEVICES WITHOUT HAVING TO BUILD CUSTOM HARDWARE AND SOFTWARE INTERFACES FOR EVERY DIFFERENT SENSOR. HE WILL ALSO BE ABLE TO EXPERIMENT WITH COMBINATIONS OF SENSORS IN PARTICULAR ENVIRONMENTS BEFORE MAKING A COMMITMENT TO USE ONE OR MORE OF THEM ON HIS ROBOT. ROBOTIC CONTROL SYSTEMS CAN BE COMPLETELY DESIGNED AND DEVELOPED ON THE SIMULATOR BEFORE THE ROBOT IS CONSTRUCTED.

MARTINGALE RESEARCH CORP
100 ALLENTOWN PKWY - STE 211
ALLEN, TX 75002
CONTRACT NUMBER: F33615-87-C-1491
DR ROBERT L DAWES
TITLE:
BIOMASSCOMP
TOPIC# 142 OFFICE: AFWAL/AA

NATURAL NEURAL NETWORKS ARE STILL OUR BEST GUIDE TO THE DESIGN PRINCIPLES OF ADAPTIVE, INTELLIGENT COMPUTING ARCHITECTURES. DETAILED KNOWLEDGE OF THE MOLECULAR BIOPHYSICAL STRUCTURES THAT MAKE BRAINS WORK WOULD BE NICE TO HAVE, BUT THAT IS NOT THE ONLY WAY TO EXTRACT NATURE'S SECRETS. THIS PROPOSAL USES THE CONCEPT OF RESONANCE AS THE MEANS TO TUNE THE PARAMETERS OF AN ARTIFICIAL NEURAL SYSTEM (ANS) SO AS TO MAXIMIZE THE STRUCTURAL SIMILARITY BETWEEN THE ANS AND A NATURAL NETWORK AND TO ACCELERATE THE EVOLUTION OF THE ANS MODEL. THE CONCEPT EXPLOITS THE CONVERGENCE OF NEUROSCIENCE METHODS AND NEUROCOMPUTING TECHNOLOGY TO LINK A NATURAL MAMMALIAN NETWORK IN CULTURE TO A TUNABLE ANS.

MATERIALS & ELECTROCHEMICAL RSCH CORP
4233 S FREMONT AVE
TUCSON, AZ 85714
CONTRACT NUMBER: 87-C-0296
DR J C WITHERS
TITLE:
LIGHTWEIGHT COMPOSITE CERAMIC LINED GUN BARRELS
TOPIC# 10 OFFICE: AFATL/MNG

SUBMITTED BY

CERAMIC LINED COMPOSIED GUN BARRELS OFFER A NEAR IDEAL MATERIALS COMBINATION TO PRODUCE LIGHT WEIGHT GUN BARRELS THAT WILL WITHSTAND 20-30 MM RAPID FIRE BALLISTIC CYCLE OF 1600-1800 DEG F AND PRESSURE UP TO 70,000 PSI FOR LESS THAN 5 MILLISECONDS AT APPROXIMATELY 1/2 THE WEIGHT OF STEEL BARRELS. A UNIQUE FABRICATION METHODOLOGY WILL BE UTILIZED TO APPLY A COMPRESSIVE METAL LAYER TO A CERAMIC LINER SUCH AS Si(3)B(4)M, SiC OR COMPOSITE ALUMINA AND THEN OVERWRAPPED WITH AN EPOXY COMPOSITE LAYER TO FORM THE LIGHT WEIGHT MULTI-LAYER COMPOSITE GUN BARREL FOR USE ON AIRCRAFT AND OTHER DEFENSE APPLICATIONS. THIS PROGRAM WILL SELECT MATERIALS, DEVELOP A COMPUTER DESIGN MODEL, DEMONSTRATE FABRICATION METHODOLOGY AND FABRICATE COMPOSITE BARRELS FOR BURST TEST AND FIRING.

MATERIALS SCIENCES CORP
GWYNEDD PLAZA II - BETHLEHEM PIKE
SPRING HOUSE, PA 19477
CONTRACT NUMBER:
BRIAN J SULLIVEN
TITLE:
ANALYSIS OF THE PROPERTIES OF SOLID PROPELLANTS
TOPIC# 225 OFFICE: BMO/MYSC

THE OBJECT OF THIS PHASE I STUDY IS TO ESTABLISH THE FEASIBILITY OF MODELING SOLID PROPELLANTS, CONSISTING OF ENERGETIC BINDERS CONTAINING VARIOUS FILLER MATERIALS, AS PARTICULATE COMPOSITES AND USING EXISTING METHODS FOR COMPOSITE PROPERTY ANALYSIS. INTERACTIONS OF CONSTITUENTS WILL BE STUDIED TO OBTAIN RELATIONS BETWEEN PHYSICAL PROPERTIES OF THE PROPELLANTS AND THE PROPERTIES AND GEOMETRY OF THE CONSTITUENTS. THERMO-MECHANICAL PROPERTIES TO BE CONSIDERED INCLUDE STIFFNESS, THEMAL EXPANSION, CREEP AND RELAXATION MODULI AND THERMAL CONDUCTIVITY. APRROACHES TO THE STRENGTH PROBLEM WILL BE FORMULATED.

MAXDEM INC
267 S FAIR OAKS AVE
PASADENA, CA 91105
CONTRACT NUMBER: F33615-87-C-5290
DR NEIL HENDRICKS
TITLE:
HIGH TEMPERATURE RIGID-ROD POLYMERS
TOPIC# 98 OFFICE: AFWAL/ML

SUBMITTED BY

WE PROPOSE TO PREPARE SEVERAL DERIVATIVES OF A NEW TYPE OF RIGID-ROD POLYMER DESIGNED TO BE SOLUBLE IN COMMON ORGANIC SOLVENTS. THE NEW POLYMERS ARE EXPECTED TO BE HIGH PERFORMANCE MATERIALS WHICH ARE ESPECIALLY EASY TO PROCESS. DURING PHASE I, NEW MONOMERS WILL BE PREPARED, AND PROPOSED POLYMERIZATION CONDITIONS WILL BE OPTIMIZED. THE NEWLY PREPARED POLYMERS WILL BE TESTED FOR THEIR THERMO-OXIDATIVE STABILITY APPLICATIONS WILL INCLUDE USE IN HIGH PERFORMANCE MOLECULAR COMPOSITES, AS ENGINEERING PLASTICS, AS TOUGHENING ADDITIVES IN CONVENTIONAL PLASTICS, AND IN SPECIALTY FIBERS.

MB DYNAMICS INC
25865 RICHMOND RD
CLEVELAND, OH 44146
CONTRACT NUMBER: F33615-87-C-1476
EDWARD L PETERSON
TITLE:
AN INTEGRATED EXPERIMENTAL AND ANALYTICAL APPROACH TO SCREENING OF PRINTED CIRCUIT BOARDS
TOPIC# 157 OFFICE: AFWAL/AA

THE PROPOSED WORK WILL PROVE FEASIBLE A COMBINED FINITE ELEMENT AND MODAL TESTING APPROACH TO DEFINING AND CONTROLLING STRAIN RESPONSE OF PCBs WITHIN PRESCRIBED LIMITS WHEN UNDERGOING ENVIRONMENTAL STRESS SCREENING VIA RANDOM VIBRATION. THE APPROACH TAKES ACCOUNT OF THE STRUCTURAL DYNAMIC CHARACTERISTICS OF THE PCB, AND INTERCONNECTIONS TO IT, WHERE FLAWS MAY EXIST TO BE PRECIPITATED TO FAILURE. ANALYSIS AND TEST TOOLS WOULD BE USED TO DESIGN A SCREENER/FIXTURE TO ACHIEVE UNIFORMITY OF PCB STRAIN RESPONSE FOR ANY SLOT IN THE FIXTURE, WHILE ACCOMMODATING PRODUCTIVITY AND COST EFFECTIVENESS ISSUES WHICH ARE OF INTEREST TO MANUFACTURING PEOPLE FOR 100% SCREENING OF PCBs. THE FIXTURE DESIGN WOULD BE ADAPTABLE TO SCREENING PHILOSOPHIES INCLUDING COMBINED ENVIRONMENTS, POWER CYCLING AND FUNCTIONAL TEST DURING SCREENING. USERS COULD THEN MAKE INFORMED TRADE-OFFS (WITH FEWER UNCONTROLLED VARIABLES) BETWEEN LEVEL AND DURATION OF SCREEN TO ACHIEVE DESIRED SCREENING EFFECTIVENESS, USEFUL LIFE CONSUMED DURING SCREENING VIA FRACTURE MECHANICS TECHNOLOGY AND USEFUL LIFE REMAINING FOR SERVICE.

MDA ENGINEERING
PO BOX 120552
ARLINGTON, TX 76012
CONTRACT NUMBER: 87-C-0339
DALE A ANDERSON
TITLE:
INTERDISCIPLINARY APPLICATIONS OF DIGITAL SIMULATION-C FLUID DYNAMICS AND RADAR CROSS-SECTION
TOPIC# 1 OFFICE: AFATL/FXA

SUBMITTED BY

COMMON TECHNOLOGY CAN BE APPLIED TO THE DIGITAL SIMULATION OF FLOW OVER AERODYNAMIC CONFIGURATIONS AND TO THE CALCULATION OF RADAR CROSS-SECTION. NUMERICAL SOLUTION OF MAXWELL'S EQUATIONS CAN BE ACHIEVED USING THE SAME GRID, DATA BASE AND NUMERICAL METHOD EMPLOYED IN COMPUTATIONAL FLUID DYNAMICS. APPLICATION OF THESE ELEMENTS FROM CFD TO THE CALCULATION OF RCS OF SIMPLE BODIES IS PROPOSED IN THIS EFFORT. VALIDATION OF THE APPROACH IS ACHIEVED BY COMPARISION OF COMPUTED RESULTS TO KNOWN ANALYTICAL SOLUTIONS. THE ULTIMATE GOAL OF THIS PROGRAM IS TO SIMULTANEOUSLY SOLVE FOR THE FLOWFIELD AND RADAR CROSS-SECTION FOR A FLIGHT VEHICLE.

MESILLA VALLEY HIGH-TECH INDUSTRIES INC
755 - N 17TH ST
LAS CRUCES, NM 88005
CONTRACT NUMBER: F29601-87-C-0049
J PETE DREXLER
TITLE:
HIGH POWER MICROWAVE (HPM) INTEGRATED CIRCUIT SCREENIN
TOPIC# 196 OFFICE: AFWL/PRC

THE OBJECTIVE OF THIS PROPOSAL EFFORT IS TO DEVELOP A SCREENING CRITERIAL OR CHIP DESIGN CRITERIA TO RESULT IN INTEGRATED CIRCUITS HARDENED TO HIGH POWER MICROWAVE EXPOSURE. THIS EFFORT WILL CONCENTRATE ON THE ANALYSIS AND STUDY OF FAILED DEVICES FURNISHED BY DOD. THE PROPOSED APPROACH TO GAIN A FUNDAMENTAL UNDERSTANDING OF THE FAILURE PROCESSES AND TO ACHIEVE HARDENED DEVICES WILL INCLUDE THE FOLLOWING: 1) DETERMINE THE NATURE OF THE FAILURE BY ELECTRICAL TEST; 2) DETERMINE THE LOCATION OF THE INDUCED DEFECTS BY DECAPSULATION AND INSPECTION BY HIGH POWERED OPTICAL MICROSCOPY AND SCANNING ELECTRON MICROSCOPY (SEM): 3) DETERMINE THE STRUCTURAL LOCATION TO SPECIFIC MASKING, DIFFUSION OR DEPOSITION LAYERS BY THE USE OF A COMBINATION OF ELECTRICAL TESTS, ETCH-BACKS OF LAYERS, AND MICROSCOPY TECHNIQUES; 4) DEDUCE POSSIBLE CAUSES OF THE SPECIFIC DEFECTS UTILIZING A KNOWLEDGE OF THE PHYSICAL STRUCTURE AND ELECTRICAL FUNCTION OF THE DEFECTIVE REGION; 5) VERIFY ACTUAL DEFECT PROCESS BY INDUCING FAILURES IN SIMILAR STRUCTURES; 6) DETERMINE THE CONDITIONS FOR TESTING WHICH WOULD STRESS THE DEVICE STRUCTURE IN QUESTION AND THOSE WHICH COULD BE USED FOR ELECTRICAL SCREENING FOR HPM HARDNESS; 7) DEDUCE CHANGE IN THE CHIP DESIGN OR MANUFACTURING PROCESS WHICH WOULD

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RESULT IN DEVICES LESS SUSCEPTIBLE TO HPM FLUENCE.

MICROCOSM INC
23720 ARLINGTON AVE - STE 5
TORRANCE, CA 90501
CONTRACT NUMBER:
THOMAS L MULLIKIN
TITLE:
NEW TECHNOLOGIES FOR CONTROL OF THE ORBITAL TRANSFER V
FOR GPS
TOPIC# 172 OFFICE: SD/SPO

MICROCOSM PROPOSES TO APPLY INNOVATIVE TECHNOLOGY TO THE PROBLEM OF PROVIDING LOW COST CONTROL FOR AN ELECTRIC PROPULSION ORBIT TRANSFER VEHICLE (OTV) FOR THE GLOBAL POSITIONING SYSTEM (GPS). SPECIFICALLY, DURING PHASE I WE WILL ESTABLISH THE SOFTWARE AND HARDWARE CONFIGURATION AND SPECIFICATIONS TO ACCOMPLISH AUTONOMOUS ORBIT AND ATTITUDE DETERMINATION AND CONTROL FOR THE OTV MISSION, ESTABLISH THE SPECIFIC ALGORITHMS FOR THIS TASK, DEVELOP A RAPID PROTOTYPE OF THE ON-BOARD SOFTWARE, AND ASSESS THE EARLY ORBIT OPERATIONS NECESSARY TO ACCOMPLISH GPS DEPLOYMENT AND RETRIEVAL OF THE OTV BY OMV OR A SIMILAR TELEOPERATED VEHICLE. MICROCOSM PERSONNEL ASSIGNED TO THIS ACTIVITY HAVE SUBSTANTIAL EXPERIENCE IN THE ABOVE AREAS AND HAVE WORKED EXTENSIVELY ON DEVELOPING LOW COST SOLUTIONS IN SYSTEMS ENGINEERING AND CONTROL OF LOW THRUST TRANSFER VEHICLES. MICROCOSM ALSO HAVE TWO PATENTS PENDING ON LOW THRUST TRANSFER AND ORBIT MAINTENANCE. PHASE I WILL CLEARLY ESTABLISH THE TECHNICAL FEASIBILITY OF PROVIDING LOW COST CONTROL FOR AN ELECTRIC PROPULSION OTV FOR DEPLOYMENT OF THE GPS SATELLITES.

MICROWAVE MONOLITHICS INC
465 E EASY ST - UNIT F
SIMI VALLEY, CA 93065
CONTRACT NUMBER:
WENDELL C PETERSEN
TITLE:
ON-CHIP TEMPERATURE COMPENSATION FOR ADVANCED MMICs
TOPIC# 44 OFFICE: RADC/XPX

SUBMITTED BY

DEVELOPMENT OF EFFECTIVE ON-CHIP TEMPERATURE COMPENSATION FOR GaAs MMICs (MONOLITHIC MICROWAVE INTEGRATED CIRCUITS) IS OF VITAL IMPORTANCE TO THE IMPLEMENTATION OF THIS TECHNOLOGY IN MICROWAVE SYSTEMS. A PROGRAM TO DEVELOP ON-CHIP TEMPERATURE COMPENSATION TECHNIQUES FOR GaAs MMIC TECHNOLOGY IS DESCRIBED IN THIS PROPOSAL. USING THESE TECHNIQUES THE SYSTEM ENVIRONMENTAL REQUIREMENTS AND MMIC TECHNOLOGY CAPABILITIES ARE COMBINED TO OPTIMIZE PERFORMANCE WHILE MINIMIZING THE COST IMPACT ON PRODUCTION COMPONENTS AND SUBSYSTEM CHIPS. PHASE I OF THE PROPOSED PROGRAM CONCENTRATES ON THE ASSESSMENT AND DESIGN OF SEVERAL PROMISING ON-CHIP TEMPERATURE COMPENSATION TECHNIQUES. FABRICATION AND OPTIMIZATION OF THE COMPENSATION CIRCUITS IN PHASE II LEADS TO A WIDE RANGE OF POSSIBLE MMIC COMPONENTS SUITABLE FOR OPERATION IN THE HARSH ENVIRONMENTS COMMONLY ENCOUNTERED IN MOST MILITARY AND COMMERCIAL APPLICATIONS.

MILLITECH CORP
PO BOX 109 - S DEERFIELD RESEARCH PK
SOUTH DEERFIELD, MA 01373
CONTRACT NUMBER: 87-C-0065
DR PAUL F GOLDSMITH
TITLE:
MONOPULSE OPTICS FOR RADAR
TOPIC# 4 OFFICE: AFATL/ASR

GAUSSIAN BEAM WEAVEGUIDE (GBW) IS A NATURAL TRANSMISSION MEDIUM FOR MULTI-SPATIAL, MULTI-POLARIZATION SYSTEMS AT MILLIMETER WAVELENGTHS. IN PHASE I OF THIS EFFORT WE WILL STUDY THE IMAGING PROPERTIES OF GBW WITH APPLICATION TO SYSTEMS REQUIRING MONOPULSE BEAM FORMATION FOR TRACKING INFORMATION. WE WILL INVESTIGATE THE DEGREE TO WHICH MINIATURIZATION OF BEAM WAVEGUIDE TECHNIQUES CAN BE PUSHED WHILE RETAINING LOW LOSS AND HIGH POLARIZATION ISOLATION. WE WILL STUDY PROMISING TECHNIQUES FOR GENERATING MONOPULSE BEAMS WHICH COULD BE USED TO ILLUMINATE A MILLIMETER APERTURE ANTENNA. BASED ON THE OUTCOME OF THE INITIAL ANALYSIS, OPTIMIZATION OF A SELECTED MONOPULSE PROCESSOR IN TERMS OF COMPACTNESS, BEAM OVERLAP, AND SYSTEM CONFIGURATION WILL BE CARRIED OUT. THIS EFFORT WILL BE PRIMARILY BASED ON NUMERICAL DIFFRACTION CALCULATIONS COUPLED WITH GAUSSIAN MODE ANALYSIS AND SUPPLEMENTED BY RAY TRACING WHERE APPROPRIATE. EXTENSIVE EXPERIENCE WITH BEAM WAVEGUIDE SYSTEM HAS SUGGESTED THE

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CONFIGURATION OF SEVERAL OPTICAL MONOPULSE PROCESSORS WHICH WILL BE THE SUBJECT OF DETAILED ANALYSIS DURING THIS PROGRAM. THE PHASE SHIFT PROPERTIES OF CRITICAL QUASIOPTICAL COMPONENTS ARE DIRECT RESULTS OF BASIC EM THEORY, WHICH IS ONE CRUCIAL ADVANTAGE OF THIS PROPAGATION MEDIUM. THUS, THIS ASPECT OF SYSTEM PERFORMANCE CAN BE PREDICTED WITH CONFIDENCE AND NEEDN'T BE ADDRESSED IN PHASE I.

MILLITECH CORP
PO BOX 109 - SOUTH DEERFIELD RESEARCH PK
SOUTH DEERFIELD, MA 01373
CONTRACT NUMBER:
DR NARESH C DEO
TITLE:
ACCELERATION-HARDENED MILLIMETER WAVE GUNN OSCILLATORS
TOPIC# 213 OFFICE: BMO/MYSC

NOVEL TECHNIQUES ARE PROPOSED FOR CONSTRUCTING W-BAND TRANSMITTER SOURCES FOR USE IN HYPERVELOCITY MODELS OF PROJECTILES. THE PROPOSED STUDY INVOLVES THE MECHANICAL AND ELECTRICAL DESIGN OF PLANAR, INTEGRATED GUNN DIODE OSCILLATORS WHICH CAN OPERATE DURING ACCELERATION GREATER THAN 100,000 G. THE SALIENT FEATURES OF THESE SOURCES ARE: PRINTED-CIRCUIT CONSTRUCTION; INDIUM PHOSPHIDE FUNDAMENTAL-MODE DESIGN; INTEGRAL ANTENNA/RADIATING ELEMENTS; AND RUGGEDIZED SEMICONDUCTOR DEVICES AND MOUNTING MECHANISMS. THE STUDY WILL FOCUS ON CRITICAL EVALUATION OF FAILURE MECHANISMS IN STANDARD OSCILLATORS, AND ANALYZE THE IMPACT OF HYPERACCELERATION ON VARIOUS CONSTITUENTS OF THE SOURCE. THE VULNERABLE ELEMENTS WILL BE MECHANICALLY REDESIGNED TO WITHSTAND THE REQUIRED SHOCK SPECIFICATIONS. SEVERAL CANDIDATE TOPOLOGIES WILL BE INVESTIGATED ANALYTICALLY TO DETERMINE THEIR PERFORMANCE CHARACTERISTICS. BASED ON THIS AND OTHER PRACTICAL CONSIDERATIONS OF FEW "PROOF-OF-CONCEPT" MODELS WILL BE FABRICATED AND ELEVATED. LIMITED ENVIRONMENTAL TESTING WILL BE CONDUCTED TO VERIFY THE VALIDITY OF ASSUMPTIONS AND DESIGN CONCEPTS. A DETAILED REPORT WILL BE PRODUCED TO PRESENT THE RESULTS AND RECOMMENDATIONS OF THE PROPOSED RESEARCH AND DEVELOPMENT ACTIVITY.

MISSION RESEARCH CORP
PO DRAWER 719 - 735 STATE ST
SANTA BARBARA, CA 93102
CONTRACT NUMBER: F33615-87-C-2168
DR GEORGE B CHAPMAN
TITLE:
AUTONOMOUS TARGET IDENTIFICATION AND THREAT RESPONSE U
COUNTERMEASURE ASSOCIATION TECHNIQUE
TOPIC# 162 OFFICE: ASD/XR

SUBMITTED BY

THE OBJECTIVES OF THE PROPOSED EFFORT ARE TO INVESTIGATE AND DEVELOP A PRELIMINARY AUTONOMOUS THREAT RESPONSE SYSTEM. THE PROPOSED SYSTEM IS DESIGNED TO COMPLEMENT CURRENT THREAT RESPONSE TECHNIQUES. SPECIFICALLY, THE COUNTERMEASURE ASSOCIATION TECHNIQUE IS DESIGNED TO HANDLE SITUATIONS WHEN THE DETECTED THREATS HAVE NOT BEEN IDENTIFIED BY INTEGRATING SUBJECTIVE AND OBJECTIVE THREAT INFORMATION USING FUZZY SET THEORY AND METHODS OF ARTIFICIAL INTELLIGENCE IN A PROCEDURE WHICH CHOOSE A SET OF COUNTERMEASURES ACCORDING TO THE ESTIMATED CM EFFECTIVENESS AGAINST THE DETECTED THREAT FEATURES. THE THREAT SIGNATURES INCLUDE THE STANDARD ELINT PARAMETERS AND IR AND/OR EO DISCRIMINATION DATA MADE AVAILABLE BY THE SENSOR SYSTEMS. THE PROPOSED APPROACH IS TO ESTABLISH THREAT FEATURE SETS (TFS'S) WHICH CORRESPOND TO EACH CM. THE TFS'S CONTAIN INFORMATION DESCRIBING THE KINDS OF THREAT SYSTEMS EACH CM IS EFFECTIVE AGAINST. BY COMPARING THE DETECTED THREAT SIGNATURES WITH THE TFS'S STORED IN THE SYSTEM'S DATA BASE, AN EFFECTIVE CM CAN BE RECOMMENDED FOR DEPLOYMENT. FEASIBILITY STUDY AND A SIMPLE DEMONSTRATION IS PROPOSED TO DEMONSTRATE THIS TECHNIQUE.

MISSION RESEARCH CORP
5434 RUFFIN RD
SAN DIEGO, CA 92119
CONTRACT NUMBER:
JAMES P RAYMOND
TITLE:
EVALUATION OF SYSTEM DESIGN TECHNIQUES TO INCREASE EFF MICROCIRCUIT HARDNESS
TOPIC# 212 OFFICE: BMO/MYSC

THE RADIATION HARDNESS OF SEMICONDUCTOR DEVICES IS A FUNCTIONAL OF ELECTRICAL BIAS DURING EXPOSURE, CHIP TEMPERATURE AND OPERATING REQUIREMENTS. THE PROPOSED PROGRAM WILL INVESTIGATE THE POTENTIAL USE OF THE MANAGEMENT OF ELECTRICAL AND ENVIRONMENTAL CONDITIONS IN A CIRCUMVENTED ELECTRONICS SUBSYSTEM TO INCREASE THE EFFECTIVE HARDNESS OF THE SEMICONDUCTOR PIECEPARTS. PARTICULAR EMPHASIS WILL BE DIRECTED TO THE USE OF MIL-QUALIFIED STANDARD MICROCIRCUITS FOR USE IN SYSTEMS WITH SEVERE RADIATION EXPOSURE REQUIREMENTS. MICROCIRCUIT TECHNOLOGIES CONSIDERED WILL INCLUDE HIGH DENSITY CMOS AND OXIDE-SEPARATED BIPOLAR FOR DIGITAL AND ANALOG APPLICATIONS. RADIATION FAILURE

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MECHANISMS CONSIDERED WILL INCLUDE LONG-TERM IONIZATION PERMANENT DAMAGE AND LATCHUP INDUCED BY EITHER PULSED IONIZING RADIATION OR A SINGLE HIGH ENERGY PARTICLE. THE PROGRAM WILL USE ADVANCED REENTRY VEHICLE ELECTRONICS CURRENTLY IN PRELIMINARY DEVELOPMENT AS A BASE-LINE TO ASSESS THE PRACTICAL MERIT OF POSSIBLE HARDENING TECHNIQUES. IN ADDITION TO HARDENING AND PERFORMANCE REQUIREMENTS, CONSTRAINTS OF HARDNESS VALIDATION AND HARDNESS ASSURANCE WILL BE CONSIDERED.

MISSION RESEARCH CORP
PO DRAWER 719
SANTA BARBARA, CA 93102
CONTRACT NUMBER:
C DAVID NEWLANDER
TITLE:
IMPROVED CONCEPTS TO REDUCE THERMOSHOCK EFFECTS IN ELE
(ANALYSIS AND EXPERIMENTS)
TOPIC# 212 OFFICE: BMO/MYSC

MISSION RESEARCH CORPORATION PROPOSES A PHASE I SBIR EFFORT TO EVALUATE THE POTENTIAL FOR THE DEVELOPMENT OF ELECTRONIC PACKAGES WHICH POSSESS SIGNIFICANT IMPROVEMENTS IN HARDNESS TO THERMOCHANICAL EFFECTS. BASED UPON PRELIMINARY STUDIES AND HYDROCODE CALCULATIONS CONDUCTED BY MRC, WE BELIEVE THAT INNOVATIVE ELECTRONIC PACKAGE CONCEPTS CAN BE DEVELOPED WHICH WILL SIGNIFICANTLY REDUCE THE THERMO-MECHANICAL SHOCK EFFECTS GENERATED IN THE ELECTRONIC DEVICES. THESE CONCEPTS ARE BASED UPON THE SELECTION OF STRESS WAVE COMPATIBLE ATTACHMENT AND SUBSTRATE MATERIALS, AND AN OPTIMIZATION OF THE GEOMETRY AND THICKNESS BASED UPON THE THREAT ENVIRONMENT. ANALYSES WILL BE CONDUCTED TO OPTIMIZE POTENTIAL PACKAGES AND MATERIALS, AND TESTS WITH ABOVE GROUND SIMULATORS WILL BE PLANNED. TEST PLANS AND APPROACHES WILL BE PREPARED FOR PHASE II TO BOTH EVALUATE AND VALIDATE THE METHODOLOGY AND TO TEST SPECIFIC HARDWARE CONCEPTS. THE SIMULATORS WILL BE CAREFULLY SELECTED IN ORDER TO PROVIDE THE PROPER LOADING CONDITIONS AND TO PROVIDE AN EXPERIMENT OF HIGH "FIDELITY". THIS PHASE I EFFORT WILL CULMINATE IN THE PREPARATION OF A PROGRAM PLAN FOR FURTHER ANALYSIS AND DEVELOPMENT/VERIFICATION TESTING TO BE ACCOMPLISHED IN PHASE II.

MISSION RESEARCH CORP
PO DRAWER 719
SANTA BARBARA, CA 93102
CONTRACT NUMBER:
DR STEVE F STONE
TITLE:
PROTECTIVE DUCT COATING STUDY
TOPIC# 27 OFFICE: AEDC/DOT

SUBMITTED BY

MISSION RESEARCH CORPORATION (MRC) PROPOSES A STUDY OF THE DUCTS AT THE ARNOLD ENGINEERING DEVELOPMENT CENTER (AEDC) TEST FACILITY TO ELIMINATE DAMAGE TO TEST ENGINES AND EROSION MODELS CAUSED BY RUST OR FOREIGN DEBRIS FROM THE SUBSTRATE OR ITS PROTECTION. DUCT INTERIOR SURFACE COATS HAVE BEEN USED BY THE FACILITY WITH LIMITED SUCCESS. MRC INTENDS TO STUDY THE FACILITY ENVIRONMENTAL CONDITIONS, THE CHEMISTRY OF RUST FORMATION AND DEVELOP SURFACE LAYER MODIFICATIONS USING SYNERGISTIC OR CHEMICAL PREPARATIONS AND A MOISTURE/AIR BARRIER LAYER OR TOP COATING TO ELIMINATE THE REFORMATION OF RUST IN THE SUBSTRATE AND PROTECT THE METAL SURFACE FROM DAMAGE. PHASE I WILL DEFINE THE MATERIALS CURRENTLY AVAILABLE FOR MODIFICATION AND INCLUDE INNOVATIVE PROCESSES AS PRIME CANDIDATES. MRC WILL FABRICATE SAMPLES AND TEST THEM UNDER EXTREME CONDITIONS IN THE LABORATORY. THE FINAL TESTING WILL BE MADE AT AEDC IN ACTUAL USE CONDITION IN PHASE II WITH SAMPLE COATINGS SELECTED FOR THEIR SURVIVABILITY. MRC PERSONNEL HAVE DEVELOPED AN EXTERNAL PROTECTION MATERIAL TESTED AT THE AEDC DUST EROSION TESTING FACILITY AND HAVE EXPERIENCE IN SURFACE PREPARATIONS, PRIMERS, COATINGS AND WITH EXPLOSIVE DEBRIS CONTAINMENT AT EXTREME ENVIRONMENT TEST CONDITIONS.

MOLTEN SALT TECHNOLOGY INC
1704 CLIFTGATERD
KNOXVILLE, TN 37909
CONTRACT NUMBER: F33615-87-C-2805
GLEB MAMANTOV
TITLE:
DEVELOPMENT OF HIGH VOLTAGE RECHARGEABLE CELLS FOR AIR MISSILE APPLICATIONS
TOPIC# 126 OFFICE: AFWAL/PO

THE PROPOSED PHASE I RESEARCH EFFORT IS DIRECTED TOWARDS THE DEVELOPMENT OF A PRACTICAL HIGH VOLTAGE RECHARGEABLE CELL (Na/BETA"-ALUMINA/S(IV) IN MOLTEN AlCl(3) + NaCl) FOR AIRCRAFT AND MISSILE APPLICATIONS. THE EMPHASIS WILL BE PLACED ON THE DEVELOPMENT OF A SUITABLE HERMETIC SEAL AND THE SELECTION OF COMPATIBLE MATERIALS. THIS CELL HAS BEEN STUDIED EXTENSIVELY AT THE UNIVERSITY OF TENNESSEE SINCE 1976. THE CELL HAS AN OPEN CIRCUIT VOLTAGE OF >4.2 V AND A THEORETICAL ENERGY DENSITY OF 726 WH/KG. ELECTROCHEMICAL PERFORMANCE OF THE PRACTICAL CELL WILL BE EVALUATED. THE FOLLOWING PARAMETERS

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WILL BE DETERMINED: CHARGE/DISCHARGE CHARACTERISTICS, ENERGY EFFICIENCY, GRAVIMETRIC AND VOLUMETRIC ENERGY DENSITY, SPECIFIC POWER DENSITY AND CYCLE LIFE. COMPLETION OF PHASE I PROGRAM SHOULD DEMONSTRATE THAT THE PRACTICAL CELL Na/BETA"-ALUMINA/S(IV) IN MOLTEN AlCl(3) + NaCl IS SUITABLE FOR INTENDED AIR FORCE APPLICATIONS.

MOSCOW ELECTRONICS CO
2424 CRUMARINE RD
MOSCOW, ID 83843
CONTRACT NUMBER:
WILLIAM C GUSTAFSON
TITLE:
PULSE TO DIGITAL CONVERSION SYSTEM
TOPIC# 26 OFFICE: AEDC/DOT

THE COMPLETE DESIGN IS PRESENTED WITHIN THIS PROPOSAL FOR A SYSTEM WHICH WILL PROVIDE A PRECISE, ONE-STEP CONVERSION DIRECTLY FROM A PULSE TRAIN INPUT TO A DIGITIZED PULSE RATE OUTPUT. IT IS A DISTRIBUTED PROCESSOR SYSTEM EMPLOYING A MASTER CONTROL PROCESSOR AND FROM 2 TO 30 IDENTICAL PULSE MODULES. THE PULSE MODULE IS A STAND-ALONE UNIT WHICH PERFORMS THE PULSE PERIOD MEASUREMENT. THE MICROPROCESSOR WITHIN EACH PULSE MODULE PERFORMS THE PULSE PERIOD TO PULSE RATE CONVERSION. THE RESULTANT PULSE RATE IS FORMATTED AND LOADED INTO THE MODULES 16-BIT OUTPUT BUFFER. THIS BUFFER IS ACTIVATED BY COMMAND FROM THE MASTER CONTROL PROCESSOR. THE MASTER CONTROL PROCESSOR PROVIDES FOR INTERNAL/EXTERNAL SYNCHRONIZATION AND AUTOCALIBRATION. THE INTERNAL SYNCHRONIZATION PERMITS THE MASTER CONTROL PROCESSORS TO DESIGNATE WHICH OF ITS 30 PULSE MODULES WILL PLACE ITS DATA ON THE COMMON 16-BIT EXTERNAL DATA BUS. EXTERNAL SYNCHRONIZATION SERVES AS THE TIMING INTERFACE BETWEEN THE MASTER CONTROL PROCESSOR AND THE EXTERNAL DATA RECORDER. AN INTERNAL REFERENCE FREQUENCY SOURCE IS USED TO PROVIDE A PRECISE TIME BASE FOR USE BY THE PULSE MODULE IN AN AUTOCALIBRATION MODE.

MPD
345 E 47TH ST
NEW YORK, NY 10017
CONTRACT NUMBER: F33615-87-C-5305
J G KAUFMAN
TITLE:
AN INTELLIGENT KNOWLEDGE SYSTEM FOR SELECTION OF MATER CRITICAL AEROSPACE APPLICATIONS (IKSMAT)
TOPIC# 107 OFFICE: AFWAL/ML

SUBMITTED BY

THE PROPOSED PHASE I PROJECT WOULD ESTABLISH THE FEASIBILITY AND DEVELOP THE SPECIFICATIONS AND WORK PLAN FOR THE DEVELOPMENT OF A PROTOTYPE COMPUTERIZED SYSTEM (PHASE II) FOR THE SELECTION AND PRELIMINARY DESIGN OF CRITICAL AEROSPACE COMPONENTS. THE SYSTEM WOULD PROVIDE A RELIABLE MATERIALS PROPERTY KNOWLEDGE BASE AND THE INFERENCE CAPABILITY TO PERMIT RAPID AND SOPHISTICATED COMPARISONS OF CANDIDATE MATERIALS, THE SELECTION OF PRIME CANDIDATES, AND ASSESSMENT OF THE IMPACT OF MATERIALS CHANGES ON KEY PERFORMANCE INDICES. THE SCOPE OF PROPERTIES WILL INCLUDE MIL-HDBK-5 DESIGN ALLOWABLES, FRACTURE TOUGHNESS, FATIGUE AND CORROSION RESISTANCE, AS WELL AS GUIDELINES FROM APPROPRIATE AEROSPACE SPECIFICATIONS; MATERIALS WILL INCLUDE ALUMINUM AND TITANIUM ALLOYS, PLUS A FEW STEELS. IMPLEMENTATION OF SUCH A COMPUTERIZED INTELLIGENT KNOWLEDGE SYSTEM (PHASE III) SHOULD GREATLY INCREASE THE EVALUATION AND INTRODUCTION OF ADVANCED MATERIALS INTO AEROSPACE STRUCTURAL APPLICATIONS, AND SHOULD BE READILY EXPANDABLE TO OTHER GOVERNMENT AGENCY AND INDUSTRIAL APPLICATONS.

MSB SYSTEMS INC
50 WASHINGTON ST
NORWALK, CT 06854
CONTRACT NUMBER:
BERNARD LICHTENSTEIN
TITLE:
LEAK DETECTION BY ACOUSTIC EMISSION MONITORING
TOPIC# 70 OFFICE: AFESC/RDXP

PHASE I WILL PROVE THE FEASIBILITY OF RELIABLE, ROBUST DETECTION OF GAS OR LIQUID LEAKS IN UNDERGROUND STORAGE TANKS AND PIPELINES, UTILIZING ACOUSTIC EMISSION MONITORING (AEM) TECHNIQUES, SUCH AS PRODUCT ARRAY PROCESSING AND FOURIER SPECTRUM PROCESSING. THE REQUIRED DETECTION THRESHOLD OF THE AEM PROCESSOR, FOR A GIVEN PROBABILITY OF DETECTION AND FALSE ALARM RATE, AND THE ACCELEROMETER SENSITIVITY WILL BE DEFINED FOR VARIOUS LIQUIDS, FUEL TANK AND PIPELINE MATERIAL, SOIL CHARACTERISTICS AND LEAK RATES. THE SPECIFICATION OF THE ACCELEROMETER ELEMENT, THE COUPLING OF THE ACCELEROMETER TO THE GROUND, AND THE ARRAY SPATIAL PROCESSING GAIN WILL BE STUDIED TO ACHIEVE RELIABLE DETECTION FOR A LOW LEAK RATE (LESS THAN 0.01 GAL/HR) AT NOMINAL DEPTH. A TECHNICAL ASSESSMENT WILL BE MADE OF

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WAVEFORM PEAK AND DIRECTIONAL DEVIATION ESTIMATION UTILIZING A SPLIT-BEAM CORRELATOR. A TECHNICAL ASSESSMENT WILL BE MADE OF SPECTRAL PEAK AND FREQUENCY ESTIMATION UTILIZING CONVENTIONAL FFT PROCESSING, AND THE UTILIZATION OF CROSS-SPECTRAL ESTIMATES OF EACH SENSOR TO DERIVE DIRECTIONAL INFORMATION. THE PERFORMANCE AND OPERATIONAL PARAMETERS FOR A COST-EFFECTIVE AEM SYSTEM WILL BE SPECIFIED FOR FABRICATION, TESTING, AND EVALUATION IN PHASE II.

MSNW INC
PO BOX 865
SAN MARCOS, CA 92069
CONTRACT NUMBER: F33615-87-C-5274
DR G H REYNOLDS
TITLE:
CHEMICAL VAPOR SYNTHESIS OF NIOBIUM ALUMINIDES
TOPIC# 105 OFFICE: AFWAL/ML

DIRECT SYNTHESIS OF NbAl ALLOY FOILS BY CHEMICAL VAPOR DEPOSITION ONTO INERT SUBSTRATES IS PROPOSED. INORGANIC, I.E. HALIDE, AND MIXED INORGANIC/ORGANOMETALLIC SOURCE GASES WILL BE USED TO SYNTHESIZE PURE Nb, PURE Al, AND INTERMETALLIC COMPOUNDS Nb3Al AND SEVERAL COMPOSITIONS BRACKETING NbAl3. DEPOSITS WILL BE CHARACTERIZED IN DETAIL BY MICROSTRUCTURAL EXAMINATION, MICROCHEMICAL ANALYSIS AND MICROMECHANICAL TESTING FOR COMPARISON TO RAPIDLY SOLIDIFIED POWDER-DERIVED ALLOYS OF SIMILAR COMPOSITIONS. ON THE BASIS OF THE RESULTS OBTAINED, PROCESS CONDITIONS CAN BE ESTABLISHED FOR FOLLOW-ON EFFORTS WHICH WOULD INCLUDE DIRECT SYNTHESIS OF TERNARY OR HIGHER ALLOYS BASED ON NbAl3.

MSNW INC
PO BOX 865
SAN MARCOS, CA 92069
CONTRACT NUMBER: F33615-87-C-5275
DR GEORGE H REYNOLDS
TITLE:
LASER PROBE VAPORIZATION/OXIDATION TESTING OF HIGH TEM COMPOSITES
TOPIC# 105 OFFICE: AFWAL/ML

SUBMITTED BY

THIS PROJECT WILL USE HIGHLY INSTRUMENTED MICROSCALE LASER TEST FACILITIES FOR REAL-TIME MEASUREMENT OF VAPORIZATION/OXIDATION PHENOMENA AT TEMPERATURES UP TO 4000 DEG F. THE TECHNIQUE WILL BE APPLIED TO FOUR MODEL COMPOSITE SYSTEMS, TWO OXIDATION-RESISTANT CARBON-CARBON COMPOSITE SYSTEMS AND TWO OXIDATION-RESISTANT CERAMIC MATRIX COMPOSITE SYSTEMS. THE MICROSTRUCTURE OF EACH MATERIAL WILL BE CHARACTERIZED IN DETAIL BOTH BEFORE AND AFTER LASER TESTING. MICROSCALE TESTING WILL BE PERFORMED USING LOCAL AREA HEATING OF TEST SPECIMENS IN VACUUM TO STUDY VAPORIZATION PHENOMENA AND IN BOTH LOW OXYGEN PARTIAL PRESSURES AND AIR TO STUDY OXIDATION PRODUCT SPECIES AND COMBINED OXIDATION/VAPORIZATION REACION PHENOMENA. ON-LINE LASER PROBE SPECTROMETRY WILL BE USED TO PROVIDE REAL-TIME DETERMINATION OF CHEMICAL SPECIES PRESENT AT TEMPERATURE IN THE NEAR-SURFACE ENVIRONMENT. THE OBSERVED PHENOMENA WILL CORRELATE WITH MICROSTRUCTURAL AND MICROCHEMICAL CHANGES DISCERNED FROM PRE- AND POST-TEST CHARACTERIZATION OF THE MODEL MATERIALS. THEORETICAL MODELING OF THERMOCHEMICAL PROCESSES EXPECTED TO OCCUR AT THESE TEMPERATURES WILL BE COMPARED TO OBSERVED VAPORIZATION/OXIDATION SPECIES. THE DEVELOPED TEST METHOD SHOULD BE USEFUL AS A MATERIALS DEVELOPMENT AND SCREENING TOOL AND MAY ALSO BE USEFUL FOR PREDICTION OF LONG-TERM HOT CORROSION BEHAVIOR FROM KNOWLEDGE OF THE BASIC REACTION INVOLVED. THE PROJECT WILL BE PERFORMED WITH THE TECHNICAL ASSISTANCE OF A CONSORTIUM OF ANTROPIX CORPORATION/HOUSTON AREA RESEARCH CENTER/RICE UNIVERSITY AS SUBCONTRACTOR.

MSNW INC
PO BOX 865
SAN MARCOS, CA 92069
CONTRACT NUMBER: F33615-87-C-5299
DR GEORGE H REYNOLDS
TITLE:
IRON WHISKER SYNTHESIS
TOPIC# 106 OFFICE: AFWAL/ML

THE PROJECT WILL EXAMINE TECHNIQUES FOR GROWTH OF HIGH PURITY IRON WHISKERS OF VARIOUS MORPHOLOGIES FROM THE VAPOR PHASE. PRECURSOR SPECIES AND DEPOSITION PROCESS PARAMETERS WILL BE SYSTEMATICALLY VARIED. PRODUCT MORPHOLOGICAL, CHEMICAL AND PHYSICAL CHARACTERISTICS, PARTICULARLY MAGNETIC PROPERTIES, WILL BE DETERMINED FOR

SUBMITTED BY

CORRELATION WITH DEPOSITION PARAMETERS AND COMPARISON TO COMMERCIAL IRON WHISKERS AND FILAMENTS.

MULTISPEC COR
25 BLACK LATCH LN
CHERRY HILL, NJ 08003
CONTRACT NUMBER:
DR DAVID SHEBY
TITLE:
ANALYZING TEL CARGOS THROUGH NONLINEAR CASCADE REPRESE
TOPIC# 203 OFFICE: BMO/MYSC

SPECIAL SIGNAL PROCESSING TECHNIQUES APPENDED ON TO REMOTE SENSING CAPABILITIES ARE DESCRIBED FOR "PEEKING" INSIDE "TEL" CARGOS.

NATIONAL TECHNICAL SYSTEMS
10150 W JEFFERSON BLVD
CULVER CITY, CA 90232
CONTRACT NUMBER:
FORREST KEITHLEY
TITLE:
HOLOGRAPHIC CONCENTRATORS FOR SOLAR THERMAL ROCKET ENG
TOPIC# 192 OFFICE: AFRPL/TSTR

CONCEPTS EXIST FOR A NEW FORM OF THERMAL ROCKET PROPULSION SYSTEM. THIS SYSTEM WOULD REQUIRE 10,000 TO 1 SOLAR ENERGY CONCENTRATION TO HEAT THE ROCKETS WORKING MEDIUM. HOLOGRAPHIC CONCENTRATORS CAN BE MADE TO SUPPLY THERMAL WAVELENGTHS TO THE ENGINE AND VISIBLE WAVE-LENGTHS TO SOLAR CELLS. THEY WOULD ALSO HAVE LOWER LAUNCH VOLUME AND MASS, HAVE SIMPLER DEPLOYMENT AND MOUNTING THAN ALTERNATE METHODS AVAILABLE, SUCH AS INFLATED LENTICULAR MIRRORS.

NICHOLS RESEARCH CORP
4040 S MEMORIAL PKWY
HUNTSVILLE, AL 35802
CONTRACT NUMBER: F04701-87-C-0108
TOM COLLIPI
TITLE:
SPACE SYSTEMS LOGISTICS CAPABILITIES ASSESSMENT MODEL
TOPIC# 170 OFFICE: SD/SPO

SUBMITTED BY

THE EFFORT OBJECTIVE IS TO DEVELOP AN INTERACTIVE MODEL TO DETERMINE SPACE SYSTEMS SUPPORT REQUIREMENTS, ENABLE SYSTEM OPERATING VULNERABILITY AND COST DRIVER ASSESSMENTS, AND FACILITATE TRADE STUDIES. THE CONCEPT FOR THE INTERACTIVE DATA BASE IS TO TIE AN ESTABLISHED EXPERT SYSTEM SHELL WITH AN EXISTING DATA BASE SHELL THAT WILL ACCOMMODATE INTERACTIVE PROCESSING WITH OTHER ALGORITHM MODULES DEDICATED TO SPECIFIC TECHNOLOGY OR ISSUE AREAS. PHASE I WILL ENTAIL A SIMPLE STRUCTURING OF THE EXPERT SYSTEM AND DATA BASE SHELLS, AS WELL AS THE DEVELOPMENT OF A STRAW ALGORITHM WHERE RELEVANT SYSTEM PARAMETERS ARE IDENTIFIED AND THEIR RELATIONSHIPS WITH OPERATIONS AND SUPPORT CAPABILITIES MODELED. THE RESULT OF PHASE I WILL BE A PROOF OF CONCEPT. PHASE II WILL INVESTIGATE SPECIFIC SYSTEM CONCEPTS AND DEVELOP GENERIC SUBSYSTEM BUILDING BLOCKS TO CONSTRUCT THE SYSTEM OF INTEREST AND THE USER WILL BE ABLE TO PERFORM SYSTEM OPERATIONS AND COST ANALYSES, TRADE STUDIES, AND SYSTEM IMPACT ASSESSMENT FOR CHANGES IS SUBSYSTEM OR OPERATIONAL PARAMETERS. THE INTERACTIVE NATURE OF THE RESULTING PROGRAM WILL ENABLE PLANNERS TO APPROACH PROGRAM ASSESSMENTS (INCLUDING SYSTEM INTEGRATION) FROM VIRTUALLY ANY ASPECT.

NICHOLS RESEARCH CORP
4040 S MEMORIAL PKWY
HUNTSVILLE, AL 35802
CONTRACT NUMBER: F33615-87-C-1487
JOSEPH MUDAR
TITLE:
ELECTRO OPTICAL SENSOR ON HYPERVELOCITY PLATFORMS
TOPIC# 146 OFFICE: AFWAL/AA

DESIGN CONSTRAINTS ON WINDOWS FOR ELECTRO-OPTICAL (EO) SENSORS ABOARD HYPERVELICITY PLATFORMS WILL BE ESTABLISHED. THESE CONSTRAINTS ARE BASED ON THE WAY SENSING OF INFRARED (IR) AND VISIBLE RADIATION ARE AFFECTED BY: (1) NEAR-WINDOW TURBULENCE, (2) IR WINDOW EMISSION INDUCED BY AERODYNAMIC HEATING, (3) DISTORTION INTRODUCED BY WINDOW CURVATURE, (4) SCATTERING AND EMISSION FROM ABLATING MATERIALS, AND (5) VISIBLE EMISSION INDUCED BY OUTGASSING. THE DESIGN CONSTRAINTS WILL BE EVALUATED FOR SPECIFIC EO SYSTEMS AND RECOMMENDATIONS FOR WINDOW MATERIALS, GEOMETRIES, AND SUPPORTING STRUCTURES WILL BE MADE.

NICHOLS RESEARCH CORP
4040 S MEMORIAL PKWY
HUNTSVILLE, AL 35802
CONTRACT NUMBER:
STEPHANIE R PATTY
TITLE:
NUCLEAR VS CONVENTIONAL WEAPONS EFFECTIVENESS COMPARIS
TOPIC# 235 OFFICE: BMO/MYSC

SUBMITTED BY

A METHODOLOGY/MODEL FOR THE CALCULATION OF LETHALITY EFFECTIVENESS EQUIVALENCY RELATIONSHIPS FOR AN EVALUATION SET OF SPECIFIC TACTICAL NUCLEAR, CONVENTIONAL UNITARY, AND ICM WEAPONS WILL BE DEVELOPED. THE APPROACH WILL CONSIST OF SPECIFIC MODIFICATIONS TO AN EXISTING COMPUTER SIMULATION MODEL, THE NICHOLS RESEARCH CORPORATION WEAPONS EFFECTIVENESS SIMULATION (WES) MODEL, WHICH WILL UTILIZE INPUTS OF CHARACTERISTIC FUNCTION PARAMETERS DERIVED FROM DATA ON THE AVAILABLE PERTINENT PHYSICAL DAMAGE CHARACTERISTICS FOR THE ELEMENTS OF THE EVALUATION SET. MODIFICATIONS TO THE EXISTING MODEL WILL ALLOW EFFECTIVENESS CALCULATIONS FOR SELECTED TEST CASES WHICH INCLUDE VARIABLE TARGET COMPLEX GEOMETRIES AND NON-UNIFORM TARGET VALUE DENSITIES. FOR THESE SELECTED TEST CASES, THE NEW SIMULATION MODEL WILL BE USED TO PRODUCE AN EFFECTIVENESS ANALYSIS FOR BOTH TARGET AND COLLATERIAL DAMAGE. THE RESULTS OF THIS ANALYSIS WILL INCLUDE A DIRECT COMPARISON OF THE NUCLEAR AND CONVENTIONAL WEAPONS IN THE EVALUATION SET ON THE BASIS OF DAMAGE AND TARGET CHARACTERISTICS VERSUS LETHALITY EFFECTIVENESS.

NIELSEN ENGINEERING & RESEARCH INC
510 CLYDE AVE
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER: F33615-87-C-3013
MICHAEL R MENDENHALL
TITLE:
CONFIGURATION ANALYSIS FOR DYNAMIC MANEUVER PERFORMANC
TOPIC# 121 OFFICE: AFWAL/FI

A PROGRAM OF WORK LEADING TO THE DEVELOPMENT OF A PREDICTION CAPABILITY APPLICABLE TO ADVANCED AIR FORCE FIGHTER CONFIGURATIONS IN UNSTEADY MANEUVERS INVOLVING NONLINEAR, TIME-DEPENDENT AERODYNAMIC CHARACTERISTICS IS PROPOSED. EXISTING ADVANCED COMPUTATIONAL TECHNIQUES TO PREDICT THE FORCES AND MOMENTS ON THE AIRCRAFT WILL BE BASED ON FLOW MODELS WHICH CORRECTLY REPRESENT THE PHYSICS OF THE ACTUAL FLOW. THE AERODYNAMICS PREDICTION MODULE WILL BE COUPLED WITH A TRAJECTORY SIMULATOR TO PREDICT FLIGHT TRAJECTORIES AND TRANSIENT PERFORMANCE OF THE AIRCRAFT IN DYNAMIC MANEUVERS. UNSTEADY VORTEX FIELDS ASSOCIATED WITH ADVANCED FIGHTER AIRCRAFT AT HIGH ANGLES OF INCIDENCE WILL BE INCLUDED FOR THE PREDICTION OF VORTEX-INDUCED NONLINEARITIES. THE PRELIMINARY DESIGN AND ANALYSIS METHOD WILL BE

SUBMITTED BY

EVALUATED BY COMPARISON OF MEASURED AND PREDICTED PERFORMANCE CHARACTERISTICS. A PILOT COMPUTER CODE WILL RESULT FROM THE PROPOSED FEASIBILITY STUDY.

NORTH STAR RSCH INC/ELECTRO-OPTICS DEVIC
BOX 1212 CHURCH ST STA
NEW YORK, NY 10008
CONTRACT NUMBER: FQ8671-8701670
M A BENJAMINSON
TITLE:
A NEW SCIENTIFIC INSTRUMENT FOR BIOGENETIC TOXICITY TE
TOPIC# 241 OFFICE: AFOST/XOT

BASED ON OUR RESEARCH, WE FEEL THAT THE STAINING PROPERTIES OF SITS (4-ACETOAMIDO-4'-ISOTHIOCYANOSTILBENE 2,2' DISULPHONIC ACID), A REAGENT WHICH ENABLES IN SITU VISUALIZATION AND DISCRIMINATION AMONG LIVING, DYING AND DEAD CELLS, MAKE IT A GOOD CANDIDATE FOR USE IN AN APPROPRIATELY DESIGNED INSTRUMENT. WE PROPOSE AN AUTOMATED VIDEO MICROSCOPE WITH MEMORY AND POSSIBLE REMOTE VIEWING CAPABILITY. IT WOULD MAKE USE OF SITS'S STAINING PROPERTIES TO PROVIDE BIOGENETIC TOXICITY MEASUREMENTS AT A REASONABLE COST. THE NEED FOR SUCH AN INSTRUMENT IS STATED IN AF 87-241. TO ESTABLISH THE FEASIBILITY OF THIS APPROACH, WE PROPOSE TO PERFORM A THOROUGH SEARCH OF GOVERNMENT, COMMERCIAL AND ACADEMIC LITERATURE USING DTIC, AVAILABLE DATA BASES AND SEARCHES AND LOCAL LIBRARY RESOURCES. AREAS OF CONCENTRATION WILL INCLUDE, TECHNICAL CHARACTERISTICS, RELIABILITY AND COST. WE SHALL INSPECT THE INSTRUMENTS, THEMSELVES WHEREVER POSSIBLE. THE COLLECTED DATA WILL BE TABULATED, ANALYZED AND SUBJECTED TO DECISION LOGIC. THE DECISION TO CONTINUE TO PHASE II, FABRICATION AND TESTING OF A SITS INSTRUMENT, WILL BE BASED ON PHASE I RESULTS.

NORTHEAST RESEARCH INSTITUTE INC (NERI)
309 FARMINGTON AVE - STE A-100
FARMINGTON, CT 06032
CONTRACT NUMBER: F8990-87-00310
IRVING N EINHORN
TITLE:
IMPROVED COMBUSTION TOXICOLOGY OF NEW PF-11 CHEMICALS
TOPIC# 84 OFFICE: AMD/RDO

SUBMITTED BY

THERE IS NO WIDELY ACCEPTED PROTOCOL FOR THE ASSESSMENT OF COMBUSTION PRODUCTS TOXICITY. MOST PROCEDURES EMPLOYED FOR THIS PURPOSE UTILIZE ENDPOINTS THAT ASSESS TIME-TO-INCAPACITATION AND LETHALITY. SUCH PROTOCOLS ARE BASED ON SAMPLE THERMAL DECOMPOSITION TECHNIQUES WHICH OFTEN DO NOT REFLECT CONDITIONS TO WHICH PF-11 CHEMICALS AND MATERIALS WILL BE EXPOSED. THE RESULTS OBTAINED USING SUCH PROTOCOLS ARE DIFFICULT TO INTERPRET AND OFTEN THERE IS INSUFFICIENT DATA TO PERMIT AN ASSESSMENT OF THE POTENTIAL TOXIC HAZARD TO HUMANS. WE WILL IN PHASE I PROGRAM DESIGN, CONSTRUCT, AND STANDARDIZE A STATE-OF-THE-ART ANIMAL EXPOSURE CHAMBER, WHICH WILL BE INTERFACED WITH A VARIETY OF COMPUTERIZED ANALYTICAL SYSTEMS TO MONITOR THE CHAMBER'S ATMOSPHERE, AND DEVELOP CRITERIA BASED ON ELECTROPHYSIOLOGICAL TECHNIQUES FOR THE ASSESSMENT OF THE FIRST OBSERVABLE DECREMENT OF PERFORMANCE IN HUMANS EXPOSED TO PYROLYSIS OR COMBUSTION PRODUCTS FROM PF-11 MATERIALS. THE RESULTS OBTAINED WILL BE UTILIZED WITHIN THE PHASE-II PROGRAM TO DEVELOP A RAPID INEXPENSIVE PROTOCOL FOR THE FIRST-TIER ASSESSMENT OF POTENTIAL TOXIC HAZARD TO HUMANS EXPOSED TO THE PYROLYSIS AND/OR COMBUSTION PRODUCTS OF PF-11 MATERIALS.

OPTRA INC
83 PINE ST
PEABODY, MA 01960
CONTRACT NUMBER:
GEERT J WYNTJES
TITLE:
PRECISION METROLOGY FOR A MICHELSON INTERFEROMETER
TOPIC# 184 OFFICE: AFGL/XOP

TO MAKE A MICHELSON INTERFEROMETER SPECTROMETER VIABLE AT SHORT AND VERY SHORT OPTICAL WAVELENGTHS REQUIRES A SUPERB METROLOGY SYSTEM CAPABLE OF ACQUIRING AND MAINTAINING ALIGNMENT BETWEEN MIRRORS TO A SMALL FRACTION OF THE WAVELENGTH. OPTRA HAS DEMONSTRATED THAT IN THE INFRA-RED PART OF THE SPECTRUM A METROLOGY SYSTEM BASED UPON A 2-FREQUENCY-HeNe LASER CAN BE HIGHLY EFFECTIVE FOR THIS PURPOSE. SUCH A LASER, IN EFFECT SIMULATES A CONSTANT, CONTINUOUS AND HIGH DIFFERENTIAL MIRROR VELOCITY WITH A VELOCITY DETERMINED BY THE LASER DIFFERENCE, BEAT OR HETERODYNE FREQUENCY. THIS MAKES IT POSSIBLE TO MEASURE MIRROR POSITION, TRAVEL AND TILT AT A RATE VIRTUALLY INDEPENDENT OF MIRROR SCAN VELOCITY AND/OR DIRECTION. OPTRA PROPOSES TO

SUBMITTED BY

DEMONSTRATE THAT BY OPTIMIZING CAPTURE RANGE, ELECTRICAL BANDWIDTH AND RADIOMETRY THE SAME SYSTEM CAN BE APPLIED TO A VERY SHORT WAVELENGTH INTERFEROMETER AND MAINTAIN MIRROR ALIGNMENT TO THE REQUISITE SMALL FRACTION OF A WAVELENGTH. THIS WILL MAINTAIN THE INTERFEROMETER MODULATION OR CHOPPING EFFICIENCY AT A HIGH LEVEL, A FACTOR OF CRITICAL IMPORTANCE FOR ANY PHOTON NOISE LIMITED MULTIPLEX SPECTROMETER.

ORD INC
PO BOX 50
NAHANT, MA 01908
CONTRACT NUMBER:
HEINRICH J KOCHLING
TITLE:
CHEMICAL DETECTION OF NERVE AGENT BY A TWO STEP DOSIME
BASED ON ENZYME INHIBITION INDICATED BY FLUORESCENCE
TOPIC# 79 OFFICE: AMD/RDO

THE LONG TERM OBJECTIVE IS TO DEVELOP A RAPID "NERVE AGENT" DOSIMETER DETECTION SYSTEM AS SIMPLE, FIELDABLE AND RUGGED AS A PIECE OF WET, CHEMICALLY IMPREGNATED CLOTH. IT WOULD HAVE THE SENSITIVITY TO DETECT LESS THAN 1 ng/m(3) OF NERVE AGENT IN THE FIELD AND THE HIGH SPECIFICITY TO AGENT PHYSIOLOGICAL FUNCTION INHERENT TO ENZYME INHIBITION. EACH DOSIMETER WOULD WEIGHT LESS THAN 1/4 OZ. AND COST LESS THAN $0.50. THIS LONG TERM OBJECTIVE WILL BE ACCOMPLISHED BY OUR UNIQUE METHOD OF SPLITTING DETECTION INTO TWO STEPS, THAT CAN EACH BE INDEPENDENTLY INVESTIGATED. THE FIRST STEP IS EXPOSURE OF THE DOSIMETER (AN ENZYME IMPREGNATED WICK) TO THE INHIBITING AGENT. THE SECOND STEP IS READ-OUT AFTER APPLYING A "DEVELOPING" CHEMICAL TO THE DOSIMETER. THIS "DEVELOPER" FLUORESCES ON CONTACT WITH UNINHIBITED ENZYME, INDICATING THE AMOUNT OF AGENT TO WHICH THE DOSIMETER WAS EXPOSED. THE FLUORESCENCE IS THEN READ-OUT WITH A RUGGED, INEXPENSIVE POCKET FLUORIMETER. THE SPECIFIC OBJECTIVE OF PHASE I IS TO INVESTIGATE THE PERFORMANCE, STABILITY AND REPRODUCIBILITY OF THE CHEMISTRY OF THE SECOND STAGE OF THE PROPOSED METHOD.

ORTEL CORP
2015 W CHESTNUT ST
ALHAMBRA, CA 91803
CONTRACT NUMBER:
DR KAM LAU
TITLE:
OPTICAL TO MICROWAVE LASER DIODE SOURCE
TOPIC# 46 OFFICE: RADC/XPX

SUBMITTED BY

THE OPTICAL OUTPUT INTENSITY OF A LASER DIODE WITH A CONTROLLED MONOLITHIC ABSORBER IS MADE TO OSCILLATE AT FREQUENCIES FROM 1 GHz TO OVER 20 GHz BY THREE METHODS: 1. BY OPERATING IN AN EXTERNAL OPTICAL CAVITY. 2. BY OPTO-ELECTRONIC FEEDBACK. 3. BY A LONG CAVITY LASER.

ORTEL CORP
2015 W CHESTNUT ST
ALHAMBRA, CA 91803
CONTRACT NUMBER: F29601-87-C-0036
DR SZEOKEUNG KWONG
TITLE:
APPLICATIONS OF NON-LINEAR OPTICS FOR PHASE AND IMAGE THROUGH ABERRATING MEDIA
TOPIC# 195 OFFICE: AFWL/PRC

WE PROPOSE TO STUDY A NEW METHOD OF SINGLE PASS IMAGE RECONSTRUCTION THROUGH DISTORTION USING NON-LINEAR PHOTO REFRACTIVE MEDIUM. THE NEW METHOD DOES NOT REQUIRE A CLEAN PUMPING BEAN AS NEEDED PREVIOUSLY PERMITTING LESS RESTRICTIONS BEING PLACED ON PRACTICAL APPLICATIONS.

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STAR RTE 2 - BOX 188 / 8000 ALPINE RD
LA HONDA, CA 94020
CONTRACT NUMBER: F33615-87-C-2158
PATRICIA WIENER
TITLE:
ADVANCED PACKAGING AND MATERIALS FOR AVIONICS SYSTEMS
TOPIC# 160 OFFICE: ASD/XR

THE REQUIREMENTS NECESSARY TO DESIGN FUTURE HIGH PERFORMANCE AVIONICS SYSTEM INCLUDE BOTH HIGH DENSITY PACKAGING AND NEW MATERIALS ALLOWING AMONG OTHERS FOR SMART SKINS TO BE SUBSTITUTED FOR PREVIOUSLY CONVENTIONAL CIRCUIT BOARDS. HELMETS AND AIRCRAFT FUSELAGE UTILIZING SUCH APPROACHES WOULD BE INVESTIGATED IN ORDER TO ENABLE THE PILOT TO CONTROL HIS ABILITY TO ACT IN THE MANY WAYS NECESSARY WITHOUT CONFIGURATION. IT WOULD ALSO ENABLE MORE PRECISE CONTROL OF THE MANNED

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AIRCRAFT OR THE MANEUVERABILITY OF UNMANNED AIRCRAFT. RESEARCH INTO THE MATERIALS AND PROCESSES NECESSARY TO DETERMINE THE FEASIBILITY OF FABRICATING ELECTRONIC SYSTEMS THAT ARE HIGH SPEED, HIGH DENSITY, AND DISTRIBUTED WHICH ALLOWS FOR HIGH DENSITY INTERCONNECT, ELECTRONIC/ OPTIC SUBSTRATES AND MODULES CONTAINING SENSORS, VHSIC DEVICES AND OTHER VLSI CIRCUITS IS A PURPOSE OF THIS STUDY. MODULES AND MATERIALS WHICH REPLACE PRINTED CIRCUIT BOARDS FOR AVIONICS SYSTEM, COMPUTERS AND IMPROVED HELMET DESIGN WILL ALLOW NEW MISSION CAPABILITIES. MODULES CONTAINING SUBSTRATES WHICH PERMIT INTERCONNECT TO BE DEFINED BY SEMICONDUCTOR PROCESSES WILL ALLOW MUCH DENSER PLACEMENT THAN IS CURRENTLY ACHIEVED BY COFIRED AL2O3 SUBSTRATES. NEW MATERIALS BASED STRUCTURES COULD ALSO HAVE THE CAPABILITY TO HOUSEATE-SENSORS, FIBER OPTIC LINKS AND DEAL WITH SIGNAL PROCESSING.

PCR INC
PO BOX 1466
GAINESVILLE, FL 32602
CONTRACT NUMBER: F33615-87-C-5279
DR RICHARD A DU BOISSON
TITLE:
HIGH TEMPERATURE LIQUID LUBRICANTS
TOPIC# 95 OFFICE: AFWAL/ML

THE OBJECT OF THIS PROJECT IS TO PREPARE NOT LESS THAN 100 CM3 OF MONOMOLECULAR PERFLUOROPOLYETHER (PFPE) MATERIALS AS POTENTIAL HIGH TEMPERATURE LUBRICANTS. THE PHYSICAL PROPERTIES OF THESE MODEL COMPOUNDS WILL BE DETERMINED AND STRUCTURE/PROPERTY CORRELATIONS USED TO GUIDE THE RESEARCH TOWARDS AN IDEAL MATERIAL. THE MAJOR EFFORT OF THIS PROJECT WILL BE DIRECTED TOWARDS PREPARING, ISOLATING AND CHARACTERING FUNCTIONALIZED SHORT CHAIN PERFLUOROETHERS AND DIFUNCTIONALIZED FLUORLINATED COMPOUNDS. SEVERAL STRUCTURALLY DIFFERENT TYPES OF PFPE WILL BE SYNTHESIZED BY LINKING SUCH PURE MATERIALS IN A CONTROLLED MANNER TO AFFORD MONOMOLECULAR PRODUCTS. COUPLING WILL INVOLVE FORMATION OF CARBON-OXYGEN AND/OR CARBON-CARBON; RESIDUAL HYDROGEN WILL BE FLUORINATED BY SF/HF AND F2 RESPECTIVELY. COMMERICAL APPLICATIONS MIGHT INCLUDE HIGH PERFORMANCE LUBRICANTS AND VAPOR DIFFUSION PUMP FLUIDES. THE MAIN BENEFIT OF THE PROJECT WILL BE IN THE UNDERSTANDING OF STRUCTURE/PROPERTY RELATIONSHIP OF THE VARIOUS PRODUCTS.

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PDA ENGINEERING
2975 RED HILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER: F33615-87-C-5277
W H PFEIFER
TITLE:
DEVELOPMENT OF ELECTROMAGNETIC INDUCTION HEATING FOR F
ADVANCED THERMOPLASTIC GRAPHITE FIBER COMPOSITES
TOPIC# 101 OFFICE: AFWAL/ML

MANUFACTURING PROBLEMS INVOLVED WITH THE FUSION AND COMPACTION OF ADVANCED THERMOPLASTIC-GRAPHITE PRECURSOR TAPE IN CONSTRUCTION OF COMPOSITE STRUCTURES HAVING CONTOURED SHAPES HAS SERIOUSLY RETARDED THE ACCEPTANCE OF THESE HIGH PERFORMANCE MATERIALS BY INDUSTRY. THE 700 TO 800 DEG F FUSION TEMPERATURE HAVE PRECLUDED THE USE OF RESILIENT POLYMERIC PRESSURE APPLICATORS CAPABLE OF CONTOUR CHANGES WHILE APPLYING UNIFORM COMPACTING PRESSURE. EXPLORATORY EXPERIMENTS HAVE SHOWN THAT HEAT PRODUCED BY INDUCTION CURRENTS WITHIN THE GRAPHITE FIBER ARRAY CAN BE DIRECTED AND CONFINED PRIMARILY AT THE INTERFACE BOND LINE BETWEEN THE FEED TAPE AND THE SUBSTRATE. CONSEQUENTLY, THE COMPACTION HEAD IN CONTACT WITH THE (HOT) PRECURSOR TAPE CAN BE CONSTRUCTED OF RESILIENT POLYMERIC MATERIALS SUCH AS TEFLON (TFE) THAT WILL READILY CONFORM TO MOLD CONTOURS. THE PROPOSED EFFORT WILL STUDY THE EXPERIMENTAL PARAMETERS INVOLVED WITH ELECTROMAGNETIC INDUCTION HEATING TECHNIQUES, FERRITE MAGNETS, COIL DESIGNS, EDDY CURRENT BRAKES, ARC SUPPRESSORS AND OTHER FEATURES, IN ORDER TO ASSESS THE FEASIBILITY OF USING THIS APPROACH FOR FABRICATING ADVANCED THERMOPLASTIC COMPOSITES. THE QUALITY OF THE INDUCTION FUSED COMPOSITE WILL BE EVALUATED USING ESTABLISHED PROCEDURES.

PDA ENGINEERING
2975 RED HILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER: F33615-87-C-3237
LEEANNE M HEINZ
TITLE:
FINITE-ELEMENT MODELS FOR SUPPORTABILITY OF UNITED STA
FORCE (USAF) AIRCRAFT STRUCTURES
TOPIC# 111 OFFICE: AFWAL/FI

SUBMITTED BY

THE FEASIBILITY OF A CENTRALIZED FINITE ELEMENT MODELING AND ANALYSIS DATA BASE SYSTEM FOR THE SUPPORT OF UNITED STATES AIR FORCE (USAF) AIRCRAFT STRUCTURES WILL BE ASSESSED. THE CENTRALIZED SYSTEM MUST BE ABLE TO OBTAIN, DEVELOP, MODIFY, EVALUATE, CERTIFY, AND APPLY THESE FINITE ELEMENT MODELS IN AN EFFICIENT MANNER. THE CURRENT SYSTEM WILL BE STUDIED TO ASSESS CURRENT METHODOLOGY AND IDENTIFY DESIGN AND ANALYSIS REQUIREMENTS. SOFTWARE AND HARDWARE TOOLS AND THEIR UTILIZATION TO SOLVE ENGINEERING PROBLEMS WILL BE EXAMINED SO THAT THEIR POTENTIAL FUNCTION IN A CENTRALIZED SYSTEM CAN BE DEFINED. COSTS OF THE CURRENT SYSTEM WILL ALSO BE ESTIMATED. IF A CENTRALIZED SYSTEM IS FEASIBLE THEN A DESIGN SPECIFICATION WILL BE WRITTEN BY PDA. PDA WILL ALSO SHOW THE UTILITY OF A CENTRALIZED SYSTEM BY ADDRESSING FINITE ELEMENT MODEL GEOMETRY AND DISCRETIZATION MODIFICATION AND LOAD APPLICATION TO VARIOUS MESHES.

PDA ENGINEERING
2975 RED HILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER:
JAMES L DELEGET
TITLE:
WIND TUNNEL SHEAR STRESS GAUGE DEVELOPMENT
TOPIC# 232 OFFICE: BMO/MYSC

THE OBJECTIVE OF THIS PROGRAM IS TO DEVELOP AND EVALUATE A GENERAL PURPOSE AREODYNAMIC SHEAR GAUGE CONCEPT FOR USE IN THE ARNOLD ENGINEERING DEVELOPMENT CENTER VON KARMAN GAS DYNAMIC WIND TUNNELS. THE GAUGE WILL BE SUFFICIENTLY SENSITIVE FOR BOTH LAMINAR AND TURBULENT FLOW SHEAR MEASUREMENTS AND WILL HAVE BIAXIAL CAPABILITY. THE GAUGE SHOULD BE SUITABLE FOR SHEAR MEASUREMENTS ON BOTH ROUGH AND SMOOTH SURFACES.

PDI TECHNOLOGY INC
246 VIKING AVE
BREA, CA 92621
CONTRACT NUMBER:
D G SWANSON
TITLE:
EVALUATION OF TWENTY FIRST CENTURY PROPULSION CONCEPTS
MICRO-PROCESSOR BASED SYSTEM SIMULATOR
TOPIC# 192 OFFICE: AFAL/TSTR

SUBMITTED BY

A NUMBER OF CONCEPTS HAVE BEEN PROPOSED FOR NUCLEAR POWERED PROPULSION SYSTEMS. THE EVALUATION OF CONCEPTS AND SELECTION OF CONCEPTS FOR FURTHER CONSIDERATIONS WILL UNDOUBTEDLY BE OF GREAT IMPORTANCE. A MEANS OF DEVELOPING, SIMULATING AND EVALUATING THESE CONCEPTS IS PROPOSED HERE. GREAT EMPHASIS HAS BEEN PLACED ON THE DEVELOPMENT OF MEANS FOR THE EVALUATION OF CONCEPTS IN DETAIL AT REASONABLE COSTS WITHIN A RESONABLE TIME. IN ORDER TO DESCRIBE THE BEHAVIOR OF SPECIFIC PROPULSION SYSTEMS UNDER A VARIETY OF TRANSIENT CONDITIONS, A SIMULATION MUST BE DEVELOPED. WITH THE ADVENT OF MINI OR MICRO-COMPUTERS, AN APPROACH TO MODEL THE PHYSICAL PROCESSES IN EACH COMPONENT IN SIGNIFICANT DETAIL IS TO BE INVESTIGATED. COMPUTATIONS ARE THEN DONE IN A PARALLEL MODE, AND DETAILED SIMULATION CAN BE APPROACHED ECONOMICALLY AND EFFICIENTLY.

PEAK SYSTEMS INC
4258 SOLAR WY
FREMONT, CA 94538
CONTRACT NUMBER: F33615-87-C-1481
DR JOHN L CROWLEY
TITLE:
Si-SiC LAYERED SEMICONDUCTOR DEVICES PREPARED BY RAPID CHEMICAL VAPOR DEPOSITION
TOPIC# 147 OFFICE: AFWAL/AA

SILICON CARBIDE (SiC) HAS LONG BEEN KNOWN AS AN ATTRACTIVE MATERIAL FOR HIGH TEMPERATURE, HIGH POWER, AND HIGH FREQUENCY ELECTRONIC DEVICES BECAUSE OF ITS LARGE BAND GAP, GOOD CARRIER MOBILITY, AND EXCELLENT PHYSICAL STABILITY. RECENT PROGRESS IN THE CHEMICAL VAPOR DEPOSITION OF EPITAXIAL LAYERS OF SiC ON SINGLE CRYSTAL SILICON SUBSTRATES HAVE INCREASED THE INTEREST IN THIS MATERIAL. PROBLEMS WITH OBTAINING LARGE AREA HIGH QUALITY FILMS REMAIN ASSOCIATED CHIEFLY WITH STRESS INDUCED CRACKING IN THE FILMS. ONE WAY TO REDUCE THE STRESS IN FILMS IS BY COMPOSITIONAL GRADING OVER DISTANCES OF 10 TO 30 MICRONS. THE APPROACH PROPOSED IN THIS WORK IS TO APPLY THE CONCEPTS EMPLOYED IN STRAINED LAYER SUPERLATTICE MATERIAL TOGETHER WITH THE CHEMICAL VAPOR DEPOSITION TECHNIQUE THAT USE A RAPID THERMAL SWITCH TO TURN ON AND OFF THE KINETICS OF FILM DEPOSITION. IN THIS WAY ALTERNATE LAYERS OF Si AND SiC CAN BE GROWN EPITAXILLY TO OBTAIN A LAYERED STRUCTURE THAT IS DEFECT FREE AND HAS AN OPTICAL BEND GAP

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THAT IS DETERMINED BY THE RATIO OF THE LAYER THICKNESSES.

PELAGOS CORP
9173 CHESAPEAKE DR
SAN DIEGO, CA 02123
CONTRACT NUMBER:
JOHN BUCK
TITLE:
LEAK DETECTION BY ACOUSTIC EMISSION MONITORING
TOPIC# 70 OFFICE: AFESC/RDXP

ADVANCED ACOUSTIC EMISSION (AE) MONITORING INSTRUMENTATION AND TESTING METHODS WILL BE APPLIED TO RESEARCH THE FEASIBILITY OF USING EXTERNAL SENSORS FOR DETECTION AND LOCATION OF LEAKS IN UNDERGROUND TANKS AND PIPELINES. THE MAIN TEST VARIABLES ARE: TYPE OF LIQUID; PRESSURE; SOIL TYPE; AND, LEAK SIZE. FIVE DIFFERENT MONITORING METHODS WILL BE APPLIED, INCLUDING LISTENING DIRECTLY ON THE OUTSIDE OF THE TANK/PIPELINES AND REMOTELY MONITORING SENSORS LOCATED ON THE SOIL SURFACE. THE DATA-PROCESSING SYSTEM TO BE USED IS ONE ALREADY IN USE FOR MONITORING FLOOR LEAKAGE IN REFINERY STORAGE TANKS. IT USES DIGITAL CONTROL OF BANDPASS FILTERS AND EXTENSIVE CORRELATION OF TRANSIENT DATA CONTAINED IN LEAK SIGNALS.

PERCEPTRONICS INC
6271 VARIEL AVE
WOODLAND HILLS, CA 91367
CONTRACT NUMBER: F04701-87-C-0109
CARL F ASIALA
TITLE:
SPACE SYSTEM LOGISTICS CAPABILITIES ASSESSMENT MODEL
TOPIC# 170 OFFICE: SD/SPO

THE AIR FORCE SPACE DIVISION'S PROGRAM MANAGERS AND PLANNERS DO NOT CURRENTLY HAVE A READILY ACCESSIBLE, EASY TO USE, INTERACTIVE METHODOLOGY FOR ASSESSING SPACE SYSTEM LOGISTICS SUPPORT. PERCEPTRONICS PROPOSES TO DEVELOP A MICRO-COMPUTER HOSTED, ANALYSIS AIDED, FORMAL MODELING SYSTEM TO BE USED TO ASSESSING SPACE SYSTEM PLANNED LOGISTICS SUPPORT. PHASE I OF THIS EFFORT IS DESIGNED TO DETERMINE THE

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FEASIBILITY OF DEVELOPING SUCH A MODELING SYSTEM. THE WORK EFFORT WILL ENTAIL: INVESTIGATING EXISTING SPACE SYSTEM SUPPORT CONCEPTS; SPECIFICALLY IDENTIFYING USER (PROGRAM MANAGERS AND PLANNERS) NEEDS; DEVELOPING A MODEL DESIGN STRUCTURE; DEVELOPING A DESIGN FUNCTIONAL SPECIFICATION; AND, DETERMINING THE TECHNICAL RISKS ASSOCIATED WITH MODEL DEVELOPMENT. THIS WORK EFFORT WILL CULMINATE IN THE DEVELOPMENT OF A PROTOTYPE SYSTEM CONSISTING OF HIGH LEVEL MENUS AND SCREENS THAT WILL DEMONSTRATE THE FEASIBILITY OF A MICRO-COMPUTER SPACE SYSTEM LOGISTICS SUPPORT MODEL. BASED UPON OUR MODELING EXPERIENCE, WE ANTICIPATE A PHASE II PROGRAM FOR CODING AND IMPLEMENTING THE FORMAL MODELING SYSTEM.

PHASEX CORP
287 EMERSON RD
LEXINGTON, MA 02173
CONTRACT NUMBER: 87-C-0346
VAL KRUKONIS
TITLE:
EXPLORATORY DEVELOPMENT ON A NEW NITROGUANIDINE RECRYS PROCESS
TOPIC# 6 OFFICE: AFATL/MNE

THE CURRENT PROCESS PRODUCES 100 MICRON NEEDLESHAPED PARTICLES OF NITROGUANIDINE WHICH ARE NOT SATISFACTORY FOR HIGH SOLIDS CONTENT FORMULATION; 400-600 MICRON SIZED SPHERICAL OR CUBICAL PARTICLES ARE DESIRED. EXPLORATORY DEVELOPMENT OF A NEW PROCESS USING SUPERCRITICAL FLUIDS IS DESCRIBED. THE CONCEPT IS BASED UPON THE ABILITY OF A SUPERCRITICAL FLUID TO ACT AS A NUCLEATING MEDIUM OR TO DISSOLVE IN A NITROGUANIDINE SOLUTION CAUSING PRECIPITATION OF PARTICLES. THE OBJECTIVES OF THE PROGRAM ARE: 1. DETERMINE THE RANGE OF PROCESS PARAMETERS THAT WILL RESULT IN THE FORMULATION OF 400-600 MICRON SIZED NITROGUANIDINE PARTICLES. 2. DELIVER 1 KG OF THE IMPROVED NITROGUANIDINE CRYSTALS FOR EVALUATION. 3. PREPARE A FLOW CHART AND CARRY OUT A PRELIMINARY ECONOMIC ASSESSMENT OF THE SUPERCRITICAL FLUID NUCLEATING PROCESS.

PHOTONIC SYSTEMS INC
1900 S HARBOR CITY BLVD
MELBOURNE, FL 32901
CONTRACT NUMBER: 87-C-0330
TODD R BADER
TITLE:
ACOUSTO-OPTIC PROCESSOR FOR SYNTHETIC APERTURE RADAR
TOPIC# 5 OFFICE: AFATL/ASR

SUBMITTED BY

PROCESSING OF SAR DATA IN REAL TIME REQUIRES HIGH SPEED COMPUTATION DEVICES CURRENTLY BEYOND THE STATE-OF-THE-ART OF CONVENTIONAL METHODS. DESIRED PROCESSORS MUST ALSO BE SMALL, RUGGED AND LOW POWER TO BE DEPLOYED ON AIRCRAFT. OPTICAL TECHNIQUES CAN SATISFY THESE REQUIREMENTS WITH IMAGINATIVE ARCHITECTURES. THIS PROPOSAL PRESENTS AN INNOVATIVE APPROACH FOR REAL TIME SAR IMAGE RECONSTRUCTION THAT CAN BE FABRICATED FOR IRBORNE APPLICATIONS. THE PROPOSED APPROACH IS A TWO DIMENSIONAL CROSS AMBIGITY FUNCTION PROCESSOR THAT UTILIZES STATE-OF-THE-ART ACOUSTO-OPTIC DEVICES IN AN IN-LINE INTERFEROMETRIC CONFIGURATION. THE PROPOSED EFFORT WILL BE AN ANALYSIS OF PERFORMANCE AND IMPLEMENTATION TRADEOFF FOR DESIGNS OPTIMIZED FOR SAR IMAGE RECONSTRUCTION.

PHYSICAL DYNAMICS INC
PO BOX 1883
LA JOLLA, CA 92038
CONTRACT NUMBER:
DR BRUCE WEST
TITLE:
RAPID MEASURES OF BRAIN ACTIVITY TO ASSESS WAKEFUL ATT
TOPIC# 74 OFFICE: AMD/RDO

WE PROPOSE THE APPLICATION OF A NEWLY DEVELOPED DATA PROCESSING TECHNIQUE TO EEG TIME SERIES. THIS TECHNIQUE WILL ALLOW US TO DEVELOP QUANTITATIVE MEASURES OF BRAIN ACTIVITY ASSOCIATED WITH WAKEFUL ATTENTIVENESS. THESE MEASURES ARE THE FRACTAL DIMENSION AND THE INFORMATION ENTROPY BOTH OF WHICH HAVE BEEN CLOSELY CORRELATED WITH CERTAIN EXTREME BEHAVIORS, I.E., EPILEPTIC SEIZURES. HEREIN WE PROPOSE TO EXTEND THESE PRELIMINARY STUDIES IN SUCH A WAY AS TO ACCESS THE STATE OF A NORMAL SUBJECT IN SITUATIONS WITH HIGH DATA FLOW AND REQUIRING RAPID DECISIONS. THE VIABILITY OF THESE MEASURES WILL BE DETERMINED IN PHASE I.

PHYSICAL RESEARCH INC
924 DELANEY AVE
ORLANDO, FL 32806
CONTRACT NUMBER: 87-C-0345
HOWARD SUGIUCHI
TITLE:
NNK END GAME ANALYSIS ON MICROCOMPUTERS
TOPIC# 1 OFFICE: AFATL/SAS

SUBMITTED BY

THE COMPLEX INTERRELATIONSHIP OF THE END GAME PARAMETERS IN AIR-TO-AIR AND SURFACE-TO-AIR NONNUCLEAR KILL WEAPON SYSTEM ENGAGEMENTS HAS TENDED TO LIMIT THE ANALYSES PERFORMED WITH STOCHASTIC (MONTE CARLO) METHODS BECAUSE OF THE INTENSIVE RESOURCES REQUIRED OF THESE METHODS. THESE METHODS ARE ALSO DIFFICULT TO IMPLEMENT EARLY IN THE DEVELOPMENT OF A WEAPON SYSTEM SINCE THEY REQUIRE DETAILS THAT ARE NOT AVAILABLE IN THE CONCEPT PHASE. THIS RESEARCH EFFORT PROPOSES TO USE ANALYTICAL TECHNIQUES ON A MICROCOMPUTER FOR RAPID EVALUATION OF THE KEY PARAMETERS OVER A WIDE RANGE OF CONDITIONS. A KEY OBJECTIVE IS TO PROVIDE THIS CAPABILITY SUCH THAT THE CRITICAL END GAME ANALYSIS CAN BE PERFORMED EARLY IN THE EVOLUTION OF A WEAPON SYSTEM. THESE TECHNIQUES WILL FIRST USE RELATIVELY SIMPLE MODELS TO PREDICT DEPENDENCIES OF VARIOUS FUZING SCHEMES TO END GAME CONDITIONS. INCLUDED WILL BE THE TIME DELAY REQUIREMENTS FOR THE WEAPON SYSTEM FUZING SCHEMES AS A FUNCTION OF THE FUZE PARAMENTERS AND VELOCITY/GEOMETRY. THIS INITIAL PHASE WILL PROVIDE THE FOUNDATION FOR INCLUSION OF MORE COMPLEX PHENOMEN SUCH AS LETHALITY.

PHYSICAL SCIENCES INC
PO BOX 3100 - RESEARCH PK
ANDOVER, MA 01810
CONTRACT NUMBER: F33615-87-C-2791
TERENCE E PARKER
TITLE:
SUPERSONIC COMBUSTION: ENHANCED IGNITION MIXING FLAME AND DIAGNOSTIC CONCEPTS
TOPIC# 134 OFFICE: AFWAL/PO

WE PROPOSE A THREE PART, PHASE I, PROGRAM OF DIRECT INTEREST TO SCRAM JET COMBUSTOR DESIGN WHICH LAYS A PROPER FOUNDATION FOR HIGH-ENTHALPY, SUPERSONIC COMBUSTING FLOW EXPERIMENTS SUITABLE FOR A PHASE II PROGRAM. BOTH PHASE I AND II RESEARCH EFFORTS FOCUS ON FUEL/AIR MIXING, WHICH WILL SIGNIFICANTLY AFFECT IGNITION AND FLAME HOLDING PERFORMANCE. A SPECIFIC INJECTOR CONFIGURATION, WHICH PRODUCES INTERSECTING OBLIQUE SHOCKS, AND ITS PERFORMANCE, WILL BE THE PRIMARY OBJECT OF STUDY; THIS INTERSECTING SHOCK FLOWFIELD HAS BEEN DEMONSTRATED TO PRODUCE ENHANCED MIXING IN SUPERSONIC FLOW DIFFUSION LASERS. THE PROPOSED CONFIGURATION HAS THE POTENTIAL OF PRODUCING ENHANCED IGNITION DUE TO INCREASED AIR TEMPERATURE IN ADDITION TO A STABLE, FLAME-

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HOLDING TYPE OF FLOW. HIGH-SPEED, COLD FLOW FUEL/AIR MIXING EXPERIMENTS, PERFORMED IN A SUPERSONIC NOZZLE, WILL OCCUPY THE BULK OF THE PHASE I EFFORT. PRIMARY EXPERIMENTAL DIAGNOSITCS ARE INTERFEROMETRY FOR SHOCK WAVE IDENTIFICATION AND DENSITY GRADIENT MAPPING IN ADDITION TO LASER-INDUCED FLUORESCENCE TO QUANTIFY THE MIXING OF PRESSURE EFFECTS UPON OH EMISSION TO SPECIFY SENSITIVITY REQUIREMENTS FOR A HIGH SPEED COMBUSTING FLOW OPTICAL DIAGNOSTIC AND A DETAILED SHOCK TUNNEL NOZZLE DESIGN FOR THE HIGH-ENTHALPY COMBUSTION FLOW EXPERIMENTS.

PINNACLE RESEARCH INSTITUTE INC
10432 N TANTAU AVE
CUPERTINO, CA 95014
CONTRACT NUMBER: 87-C-0329
DR GARY BULLARD
TITLE:
HIGH TEMPERATURE SOLID-STATE DOUBLE LAYER CAPACITOR
TOPIC# 13 OFFICE: AFATL/MNF

FUZING DEVICE ENERGY STORAGE REQUIREMENTS HAVE EXCEEDED THE ENERGY DENSITIES AVAILABLE IN CURRENT CAPACITOR TECHNOLOGY. OPERATING REQUIREMENTS ALSO ULTIMATELY DESIRED INCLUDE THE CAPABILITY TO HOLD CHARGE FOR THREE DAYS AND ENDURE 220 DEG F. PRI PROPOSES THE CONCEPT OF A SOLID-STATE DOUBLE LAYER CAPACITOR WHICH COULD OPERATE NEAR 200 DEG C, PRESERVE CHARGE, AND BE IMPACT RESISTANT. DOUBLE LAYER CAPACITANCE DENSITIES ARE TO BE EXPECTED.

PINNACLE RESEARCH INSTITUTE INC
10432 N TANTAU AVE
CUPERTINO, CA 95014
CONTRACT NUMBER: F33615-87-C-2800
DR G L BULLARD
TITLE:
HIGH POWER FOR SPACE APPLICATIONS
TOPIC# 125 OFFICE: AFWAL/PO

THE RECENT INTEREST IN SPACE-BASED WEAPONS AND SURVEILLANCE SYSTEMS HAS CREATED A VOID IN THE AREA OF POWER GENERATION, CONDITIONING, AND

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STORAGE. REQUIREMENTS HAVE BEEN DEVELOPED FOR LEVELS OF ENERGY AND POWER NEVER SERIOUSLY ADDRESSED BEFORE. PINNACLE RESEARCH INSTITUTE PROPOSES A DEVELOPMENT PROGRAM WHICH ADDRESSES THE AREAS OF POWER CONDITIONING AND ENERGY STORAGE THROUGH A PROPRIETARY DOUBLE LAYER CAPACITOR TECHNOLOGY. THIS TECHNOLOGY (THE PRI ULTRACAPACITOR) PROVIDES AN UNSURPASSED ENERGY DENSITY/POWER DENSITY COMBINATION. ITS PERFORMANCE PLACES IT AS A FUNTIONAL LINK BETWEEN BATTERIES AND CAPACITORS. THE PROGRAM PROPOSED HERE INVOLVES THE CONSTRUCTION OF A 200V, 1000 JOULE/POUND DEVICE TO BE TESTED UNDER REPRESENTATIVE PULSE DISCHARGE CONDITIONS. THIS IS THE FIRST STEP IN THE ULTIMATE DEVELOPMENT OF MULTI-KILOVOLT, HIGH ENERGY DENSITY CAPACITORS.

POTOMAC PHOTONICS INC
UNIVERSITY OF MARYLAND - BLDG 335
COLLEGE PARK, MD 20742
CONTRACT NUMBER: FQ8671-8701381
C PAUL CHRISTENSEN
TITLE:
CW EXCIMER LASER
TOPIC# 241 OFFICE: AFOST/XOT

INVESTIGATION OF A NEW TYPE OF RARE GAS HALIDE EXCIMER LASER IS PROPOSED. THE NEW DEVICE IS POTENTIALLY CAPABLE OF CONTINUOUS ULTRAVIOLET OUTPUT AND UTILIZES MICROWAVE DISCHARGE EXCITATION OF MULTIATMOSPHERIC GAS MIXTURES IN NARROW-BORE HOLLOW WAVEGUIDES. RECOMBINATION OF HALOGEN MOLECULES DISSOCIATED DURING THE DISCHARGE IS ACCELERATED BY RAPID DIFFUSION OF THE MOLECULAR FRAGMENTS TO THE WALL OF THE NARROW-BORE TUBE.

POTOMAC SYNERGETICS INC (PSI)
PO BOX 953
McLEAN, VA 22101
CONTRACT NUMBER: F29601-87-C-0038
V J CORCORAN
TITLE:
OPTICAL AMPLIFIERS WITH PHASE FIDELITY
TOPIC# 198 OFFICE: AFWL/PRC

SUBMITTED BY

PSI PROPOSES TO STUDY NONLINEAR EFFECTS AS MEANS TO PRODUCE LOW NOISE OPTICAL AMPLIFICATION. THE NONLINEAR PHENOMENA INCLUDE, BUT ARE NOT LIMITED TO, SIMULATED SCATTERING AND WAVE MIXING. A BROAD LITERATURE SEARCH AND ANALYSIS OF THE APPLICABILITY OF THESE TECHNOLOGIES FOR PHASE PRESERVING OPTICAL AMPLIFIERS WILL BE MADE. APPLICABILITY ISSUES INCLUDE FIDELITY OF PHASE IMPRINT FROM A WEAK BEAM ONTO AN AMPLIFIED BEAM, NOISE ISSUES AND SCALABILITY. WAVE MIXING PROCESSES INCLUDE, BUT AR NOT LIMITED TO, TWO BEAM COUPLING, PARAMETRIC MIXING, UP-CONVERSION AND DOWN-CONVERSION MAY ALSO PROVE USEFUL AS NONLINEAR OPTICS PHASE PRESERVING AMPLIFIERS. THE END PRODUCT OF PHASE I WILL BE A CONCEPTUAL ANALYSIS AND COMPUTER MODEL OF THE EFFECTIVENESS OF SEVERAL KEY TECHNOLOGIES FOR OPTICAL AMPLIFICATION (INCLUDING MODELS OF PHASE AND IMAGE FIDELITY).

PRESTIGIOUS TECHNOLOGY SERVICES INC
833 McKINNEY ST
ARLINGTON, TX 76012
CONTRACT NUMBER: F33615-87-C-5284
BRENNAN A FORCHT
TITLE:
LIGHT WEIGHT AEROSTRUCTURAL COMPOSITES FOR 1800 F TO 4
FASTENER APPLICATIONS
TOPIC# 100 OFFICE: AFWAL/ML

CRITICAL TO DEVELOPMENT OF A TRANSATMOSPHERIC VEHICLE ARE LIGHT WEIGHT MATERIALS FOR ABOVE 1800 F STRUCTURAL APPLICATIONS. CARBON-CARBON COMPOSITES WITH OXIDATION RESISTANCE WILL BE REQUIRED IN A TAW AIRFRAME AS 2500 F HIGH STRENGTH FASTENERS. RESEARCH IN JOINING, REINFORCEMENTS, MATRICES, AND OXIDATION PROTECTION REMAINS. HIGH TEMPERATURE FASTENERS TO WITHSTAND AERODYNAMIC HEATING OF THE AIR-FRAME WILL BE A MAJOR CHALLENGE. BECAUSE OF SUSTAINED HYPERSONIC VELOCITIES WITHIN THE ATMOSPHERE, TOTAL STRUCTURAL HEAT LOAD WILL DOMINATE THE DESIGN. JOINING TECHNIQUES EMPLOYING CARBON BONDS MIGHT IMPOSE WEIGHT PENALTY RESTRICTIONS ON SIZE OF AERODYNAMIC SURFACES FOR DESIGN CONSIDERATIONS, AND THERMAL EXPANSION MISMATCH PROBLEMS WITH REGENERATIVELY COOLED SUBSTRUCTURES. A MECHANICAL FASTENER, OPERABLE AT 2500 F, WOULD PERMIT THE DESIGNER AN APPROACH FOR THE AEROVEHICLE PROJECT. PHASE I INCLUDES EXPERIMENTAL INVESTIGATIONS TO EXAMINE FIBERS, MATRICES, UNIQUE CHEMICAL AND MECHANICAL INTERAC-

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TIONS; BATCH AND CONTINUOUS PROCESSING, AND COMPOSITE PROPERTIES. PHASE II, KAISER AEROTECH, FOCUSES ON SPECIMENS FOR STRENGTHS AT OXIDIZING TEMPERATURES AND POTENTIAL PAYOFFS/PROBLEMS OF LARGE COMPONENTS. PHASE III, KAISER AEROTECH, FABRICATES LARGE COMPONENTS WITH DEVELOPED FASTENERS, REPRESENTATIVE OF A LARGE AEROVEHICLE.

Q-DOT INC
1069 ELKTON DR
COLORADO SPRINGS, CO 80907
CONTRACT NUMBER:
THOMAS E LINNENBRINK
TITLE:
A FULL-BANDWIDTH DIRECT PULSE-TO-DIGITAL CONVERTER
TOPIC# 26 OFFICE: AEDC/DOT

A UNIQUE, DIRECT PULSE-TO-DIGITAL CONVERTER WILL BE DESIGNED AND DEMONSTRATED. IN GENERAL, SIGNAL CONDITIONING FOR TURBINE FLOW METERS AND TACHOMETERS COMMONLY EMPLOY SIGNAL CONVERSIONS TO OBTAIN A DATA FORMAT SUITABLE FOR DIGITAL RECORDING. THE PULSE OUTPUT OF THE TRANSDUCER IS FIRST CONVERTED TO AN ANALOG SIGNAL WHICH THEN UNDERGOES AN ANALOG-TO-DIGITAL CONVERSION. THESE CONVERSIONS INTRODUCE ADDITIONAL MEASUREMENT ERRORS WHICH COULD BE ELIMINATED IF A DIRECT, ONE-STEP PULSE-TO-DIGITAL CONVERSION WERE USED. IN ADDITION, THE PROPOSED TECHNIQUE MAINTAINS THE FULL BANDWIDTH OF THE TRANSDUCER. A PROOF-OF-CONCEPT BREADBOARD WILL BE BUILT TO DEMONSTRATE THE PERFORMANCE OF A SINGLE CHANNEL OF THE REQUIRED 30-CHANNEL SYSTEM. THE PRELIMINARY DESIGN OF THE FULL, 30-CHANNEL SYSTEM WILL BE COMPLETED, AND A PLAN WILL BE STRUCTURED TO DEVELOP IT.

QUALCOMM INC
10555 SORRENTO VALLEY RD
SAN DIEGO, CA 92121
CONTRACT NUMBER: F19628-87-C-0175
KLEIN S GILHOUSEN
TITLE:
RTABLE/MOBILE X-BAND SATCOM TERMINAL FEASIBILITY STU
TOPIC# 36 OFFICE: ESD/XR

SUBMITTED BY

THE PORTABLE/MOBILE X-BAND SATCOM TERMINAL FEASIBILITY STUDY, ADDRESSES A PERCEIVED REQUIREMENT FOR AN X-BAND SATELLITE COMMUNICATIONS TERMINAL THAT WOULD ALLOW PORTABLE/MOBILE OPERATION AT DATA RATES UP TO 9600 BPS WITH A TERMINAL OF VERY SMALL SIZE. THE ELECTRONICS WOULD BE SMALL ENOUGH TO BE CARRIED ONTO AN AIRLINER, WHILE THE ANTENNA WOULD BE THE SIZE OF A TENNIS BALL FOR MOBILE OPERATION, AND A 12 INCH DIAMETER PARABOLIC DISH ANTENNA FOR PORTABLE OPERATION. THE MOBILE MODE OF OPERATION WOULD INCLUDE A PAGING FEATURE THAT WOULD INFORM THE OPERATOR THAT A HIGH DATA RATE (9600 BPS) LINK IS DESIRED SO THAT THE OPERATOR CAN STOP, SETUP AND POINT THE DISH ANTENNA TO SUPPORT THE HIGHER DATA RATE. SUCH A TERMINAL WOULD APPEAR TO HAVE MANY POTENTIAL APPLICATIONS IN BOTH COMMERCIAL AND GOVERNMENT SATELLITE COMMUNICATIONS.

R E A PRECISION MACHINE CO INC
PO BOX 3229 - 83 BROADWAY ST
WESTFORD, MA 01886
CONTRACT NUMBER: F33615-87-C-5287
ROBERT E ACHESON
TITLE:
A NEW DESIGN FOR OPTICALLY FLAT AND DAMAGE FREE POLISH
INCH DIAMETER GaAs AND InP WAFERS
TOPIC# 93 OFFICE: AFWAL/ML

A POLISHING MACHINE CONCEPT WAS DEVISED FOR NON-ABRASIVE POLISHING OF THREE INCH DIAMETER (OR LARGER) SEMICONDUCTOR WAFERS OF GaAs, INP AND SIMILAR MATERIALS. THE POLISHING PRINCIPLE IS BASE ON A TECHNIQUE DEVELOPED BY MIT LINCOLN LABORATORY SCIENTISTS CALLED "HYDROPLANE POLISHING OF SEMICONDUCTOR CRYSTALS". THIS NEW CONCEPT, HOWEVER, DOES NOT DEPEND ON THE CENTRIFUGAL DISTRIBUTION OF THE POLISHING LIQUID, BUT RATHER ON A LEVITATION PROCESS WHICH ALLOWS FOR THE POLISHING OF VERY LARGE AREA WAFERS. THE NEW PROCESS FURTHER INFINITE CONTROL OF THE FORCE BETWEEN THE LIQUID AND THE SAMPLE TO BE POLISHED. THE ROTATION OF THE SAMPLE RELATIVE TO THE LIQUID MAY ALSO BE INDEPENDENTLY CONTROLLED. INITIAL TESTS HAVE SHOWN THAT THE LEVITATION, FORCE VARIATION BETWEEN THE SAMPLE AND LIQUID, AND INDEPENDENT SAMPLE-LIQUID ROTATION ARE SIMULTANEOUSLY FEASIBLE.

RAMSEARCH CO
14622 SANDY RIDGE RD
SILVER SPRING, MD 20904
CONTRACT NUMBER: F33615-87-C-5310
KAREN J RICHTER
TITLE:
A COMPUTERIZED METHODOLOGY FOR UNIFIED LIFE CYCLE ENGI
EVALUATION OF DIGITAL ELECTRONICS
TOPIC# 90 OFFICE: AMD/RDO

SUBMITTED BY

PROPOSED IS THE DEVELOPMENT OF AN INNOVATIVE APPROACH TO UNIFIED LIFE CYCLE ENGINEERING (ULCE) FOR EVALUATION OF DIGITAL ELECTRONICS DESIGN. THIS APPROACH CAN BE APPLIED CONTINUOUSLY THROUGHOUT THE BIDDING, INITIAL AND FINAL DESIGN PROCESSES. THE DEVELOPMENT WILL FOCUS ON THE INTEGRATION OF COMPUTER AIDED DESIGN TECHNIQUES WITH A ULCE METHODOLOGY SO THAT BOTH THE CONTRACTOR AND SUPPLIER CAN CONTINUOUSLY MONITOR AND EVALUATE THE DESIGN PROJECT. A UNIQUE ASPECT OF THE PROPOSED PROJECT IS THE IMPLEMENTATION (DURING PHASE II) AND FORMALIZATION OF A ULCE METHODOLOGY WHICH WE ARE CALLING 'LIFE CYCLE DESIGN BY PROGRESSIVE APPROXIMATION'.

RAMSEARCH CO
14622 SANDY RIDGE RD
SILVER SPRING, MD 20904
CONTRACT NUMBER: F33615-87-C-5315
GREGORY BRAUNBERG
TITLE:
COMPUTER-AIDED LIFE CYCLE ENGINEERING WORKSTATION: A SUPPORT SYSTEM FOR COMPUTER-AIDED LIFE CYCLE ENGINEERI
TOPIC# 90 OFFICE: AMD/RDO

THE PRIMARY OBJECTIVE OF THIS PROJECT IS TO DEVELOP A PROTOTYPE OF A UNIQUE APPROACH TO UNIFIED LIFE CYCLE ENGINEERING (ULCE), CALLED THE RAMSEARCH COMPUTER-AIDED LIFE CYCLE ENGINEERING (CALCE) WORKSTATION IN PREPARATION FOR IMPLEMENTATION IN THE SBIR PHASE II. THE CALCE WORKSTATION SOFTWARE SYSTEM IS AN INTELLIGENT SHELL STRUCTURE FOR A DESIGN ENGINEERING DECISION SUPPORT SYSTEM WHICH CAN BE ADAPTED BY EACH USING ORGANIZATION TO ITS OWN PARTICULAR SUPPORTABILITY DESIGN NEEDS. CALCE WILL EMPLOY BOTH EXPERT SYSTEM AND NATURAL LANGUAGE INTERFACE TECHNIQUES. THIS WILL INCLUDE A MECHANISM FOR CREATING, UPDATING, AND USING A DESIGN RULE DATABASE WHICH CAN BE ADAPTED TO DEFENSE CONTRACTOR'S NEEDS. CALCE WILL BE USEFUL TO DESIGNERS IN ANY DISCIPLINE WHO WISH TO ADOPT THE LIFE CYCLE VIEW OF DESIGN. CALCE IS AIMED AT INCREASING THE INTERACTION BETWEEN VARIOUS DESIGN DISCIPLINES AND PROVIDING THE ABILITY TO OPTIMIZE AMONG COMPETING DESIGN GOALS SO THAT SUPPORTABILITY CONSIDERATIONS CAN BE AN EFFECTIVE ELEMENT OF THE DESIGN PROCESS.

REKENTHALER TECHNOLOGY ASSOCS CORP
3400 JENNINGS CHAPEL RD
WOODBINE, MD 21797
CONTRACT NUMBER: F33615-87-C-3611
TIMOTHY A ZIMMERLIN
TITLE:
TACTICAL SITUATION DISPLAY SYSTEM
TOPIC# 122 OFFICE: AFWAL/FI

SUBMITTED BY

DEFINITION OF LOGISTICS SUPPORT REQUIREMENTS FOR CREATION,MAINTENANCE AND EXPLOITATION OF COMPUTERIZED DATA BASES WHICH SUPPORT PILOT/AIRCREW MISSION/FLIGHT PLANNING, AND INFLIGHT NEEDS. THIS CONCEPT DESIGN STUDY ADDRESSES LOGISTICS-RELATED HARDWARE, SOFTWARE, AND DATA ARCHITECTURES FOR A TACTICAL SITUATION DISPLAY SYSTEM (TSDS) FOR SQUADRON-LEVEL EXPLOITATION BY FLIGHT CREWS, BOTH ON THE GROUND, AND IN THE AIR. WHEN THE CONCEPT IS IMPLEMENTED, AIRCREWS WILL ENJOY DMA DTED- AND DFAS-BASED PROFILE AND PLANFORM COLOR PRESENTATIONS OF FLIGHT PATHS, THREAT AVOIDANCE DISPLAYS, OVERLAYS OF IMAGERY ALONG THE ROUTE, TARGET DISPLAY, OPERATIONS ORDERS OVERLAYS, NAVIGATION DATA, INTELLIGENCE OVERLAYS, WEATHER DATA, INTER ALIA. EXTRACTS OF THE ABOVE LISTED DATA ELEMENTS WILL BE AVAILABLE FOR INTEGRATION WITH AIRCRAFT SYSTEMS FOR AIRBORNE APPLICATIONS. THE END-TO-END LOGISTICS CYCLE FOR DATA BASE SUPPORT IS ADDRESSED HERE.

RESOURCE INTERNATIONAL INC
281 ENTERPRISE DR
WESTERVILLE, OH 43081
CONTRACT NUMBER:
A ABDULSHAFI
TITLE:
MODIFIERS FOR ASPHALT CONCRETE
TOPIC# 67 OFFICE: AFESC/RDXP

HIGH TIRE PRESSURE AND THRUST VECTORING ON ASPHALT CONCRETE AIRFIELD RUNWAYS ARE DETRIMENTAL FACTORS TO SERVICEABILITY PERFORMANCE CHARACTERISTICS OF THESE SURFACES. RUTTING, RAVELING AND CRACKING ARE SOME DISTRESS MANIFESTATIONS BY WHICH RUNWAY PAVEMENTS WILL DETERIORATE. HOWEVER, NEW AND INNOVATIVE MATERIALS--ADDITIVES/ADMIXTURES, EXTENDERS, OR ALTERNATE BINDERS--WITH THE POTENTIAL TO SOLVE THE PROBLEMS HAVE BEEN INTRODUCED TO THE MARKET. SOME MATERIALS HAVE BEEN LABORATORY AND FIELD TRIED ON A LIMITED BASIS, BUT FOR DIFFERENT APPLICATIONS AND UNDER LESS SEVERE LOADING CONDITIONS THAN THAT ANTICIPATED ON THE AIRFIELD PAVEMENT. THERE IS A NEED TO INVESTIGATE THESE MATERIALS FOR THIS SPECIFIC APPLICATION AND TO CONSIDER SUCH FACTORS AS THE SCREENING CRITERIA (COMPATIBILITY WITH ASPHALT CEMENT, POTENTIAL CANDIDACY TO SOLVE THE PROBLEMS, AND COST PROHIBITIVE FACTORS), MIX DESIGN SPECIFICATION AND QUALITY/CONTROL TESTING, AS WELL AS COST EFFECTIVENESS PROCEDURES. PHASE I OF THIS

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RESEARCH IS CONCERNED WITH DEVELOPMENT OF THE SCREENING CRITERIA AND DESIGN OF EXPERIMENT FOR PHASE II; PHASE II WILL ADDRESS LABORATORY/ FIELD CHARACTERISTICS, DEVELOPMENT OF Q/C TESTS AND SPECIFICATIONS (MIXTURE, SPECIAL PROVISION FOR CONSTRUCTION), AND THE EVALUATION OF COST EFFECTIVENESS.

RESOURCE INTERNATIONAL INC
281 ENTERPRISE DR
WESTERVILLE, OH 43081
CONTRACT NUMBER:
KAMRAN MAJIDZADEH
TITLE:
COMPOSITE MATERIAL TESTER
TOPIC# 24 OFFICE: AEDC/DOT

THE CONCEPT OF A DYNAMIC TESTING DEVICE CAPABLE OF ACHIEVING STRAIN RATES IN THE RANGE OF 104/MIN. FOR TESTING GRAPHITIC COMPOSITE MATERIAL IS DESCRIBED. THIS DEVICE CAN BE USED TO PERFORM TESTS IN BOTH TENSION AS WELL AS IN CROSS AXIS SHEAR ON COMPOSITES TO EVALUATE DYNAMIC PROPERTIES FOR DESIGN APPLICATIONS. SPECIFIC ATTENTION RELATED TO THE DESIGN OF THIS DEVICE IS FOCUSED ON THE TYPE OF TEST SPECIMEN CONFIGURATION, THE DESIGN OF A HOLDING DEVICE FOR THE SPECIMENS AND THE SELECTION OF AN APPROPRIATE TESTING PROCEDURE.

ROBBINS CO
22445 - 76TH AVE S
KENT, WA 98031
CONTRACT NUMBER:
DR GERALD L DOLLINGER
TITLE:
IMPROVED DISC CUTTER DESIGN FOR EGRESS BORING MACHINES
TOPIC# 209 OFFICE: BMO/MYSC

DISC CUTTERS USED FOR EGRESS BORING MACHINE APPLICATIONS REQUIRE UNIQUE DESIGN FEATURES. CUTTERS USED ON CONVENTIONAL TUNNEL BORING MACHINES ARE DESIGNED FOR BEST PERFORMANCE AND LIFE CYCLE COSTS WITH CUTTER REPLACEMENT BEING AN ACCEPTABLE FACTOR IN THEIR DESIGN. THIS PROPOSAL ADDRESSES A SYSTEMS ENGINEERING APPROACH TO DEVELOP OPTIMUM

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DISC CUTTER DESIGNS WITH CUTTER REPLACEMENT BEING UNACCEPTABLE. THE PROGRAM WILL CONCENTRATE ON THREE FUNDAMENTAL OBJECTIVES: (1) INCREASED LOAD CAPACITY; (2) INCREASED WEAR RESISTANCE; AND (3) INCREASED RELIABILITY. PHASE I WILL CONSIST OF DESIGN ANALYSIS AND A TRADE STUDY TO IDENTIFY IMPROVED DISC CUTTER RING GEOMETRIES, ASSEMBLY CONFIGURATIONS AND METALLURGIES. A MATHEMATICAL FINITE ELEMENT MODEL OF A CUTTER RING WILL BE DEVELOPED TO PREDICT STATIC DEFLECTION AND STRESS DISTRIBUTIONS. THIS MODEL WILL BE VERIFIED BY LABORATORY STATIC LOAD TESTS. ADDITIONALLY, A STUDY OF MATERIALS AND PROCESSES WILL BE MADE TO IDENTIFY ALTERNATE RING METALLURGIES AVAILABLE TO ACHIEVE OPTIMUM ABRASION RESISTANCE/TOUGHNESS COMBINATIONS. FINALLY, PHASE I WILL CONCLUDE WITH A SERIES OF DISC CUTTER DESIGN IMPROVEMENTS THAT MEET THE FUNDAMENTAL OBJECTIVES. PHASE II WILL THEN ADDRESS FINAL DESIGN ANALYSIS USING DYNAMIC FINITE ELEMENT MODELING AND FABRICATION OF PROTOTYPES FOR FULL LABORATORY AND FIELD TESTING.

ROBBINS CO
22445 - 76TH AVE S
KENT, WA 98031
CONTRACT NUMBER:
PETER B DOWDEN
TITLE:
LONG TERM STORAGE EFFECTS ON DISC CUTTERS
TOPIC# 209 OFFICE: BMO/MYSC

THE EGRESS PROGRAM WILL IMPOSE A REQUIREMENT ON DISC CUTTERS WHICH HAS NOT BEEN ADDRESSED IN COMMERCIAL WORK. THE EGRESS CUTTERS MUST WITHSTAND LONG TERM STORAGE IN AN UNDERGROUND ENVIRONMENT, AND THEN FUNCTION RELIABLY. IN COMMERCIAL WORK A RULE OF THUMB IS TO REPLACE OR REBUILD CUTTERS IF STORAGE EXCEED FOR (4) MONTHS. THEREFORE, NO DATA EXISTS ON THE EFFECTS OF LONG TERM BEARING DEFORMATION, LUBRICANT DEGRADATION, SEAL ELASTOMER DETERIORATION, COMPONENT CORROSION OR OTHER AGING PHENOMENON WHICH COULD CAUSE MISSION FAILURE. THE PHASE I EFFORT PROPOSED WILL IDENTIFY AND ADDRESS ALL THE STORAGE ISSUES IN A TYPICAL CUTTER CONFIGURATION. IN ADDITION, A METHODOLOGY FOR ANALYZING FAILURE MODES WILL BE DEVELOPED. FINALLY, THE FEASIBILITY OF SPECIFIC DESIGN CHANGES DIRECTED AT THE LIMITED PERFORMANCE REQUIREMENTS OF A CUTTER, AFTER LONG TERM STORAGE, WILL BE INVESTIGATED. PHASE II EFFORTS WOULD INCLUDE THE MANUFACTURE OF SPECIALIZED

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CUTTERS, ACCELERATED LIFE TESTS, AND PROOF OF PERFORMANCE TESTS. THE ANALYSIS METHODOLOGY DEVELOPED IN PHASE I WILL BE APPLIED TO ASSESS WHETHER A CUTTER CAN BE DEVELOPED TO SERVICE BOTH STORAGE AND PERFORMANCE REQUIREMENTS, OR IF PERIODIC MAINTENANCE OR REPLACEMENT IS NECESSARY.

RODGARD CORP
1355 CLINTON ST
BUFFALO, NY 14206
CONTRACT NUMBER: F33615-87-C-3409
RICHARD E HAUCK
TITLE:
DEVELOPMENT OF RUN-FLAT CAPABILITY FOR AIRCRAFT TIRES
TOPIC# 114 OFFICE: AFWAL/FI

RODGARD'S 11 YEARS OF EXPERIENCE IN THE ENGINEERING, DESIGN, DEVELOPMENT AND MANUFACTURING OF RUN-FLAT SYSTEMS FOR MILITARY, GOVERNMENT AGENCY AND COMMERCIAL APPLICATIONS WILL BE USED TO DEVELOP A STATE-OF-THE-ART RUN-FLAT SYSTEM FOR AIRCRAFT TIRES WHICH WILL: (1) NOT DEGRADE TIRE DURABILITY OR PERFORMANCE DURING NORMAL TAKEOFF, LANDING, AND TAXI OPERATIONS; (2) NOT CHANGE THE EXTERNAL SHAPE, SIZE OR VOLUME OF EXISTING TIRE; (3) BE EASY TO INSTALL AND REQUIRE NO MAINTENANCE DURING NORMAL OPERATION; AND (4) PROVIDE A BACKUP LOAD CARRYING CAPABILITY SUITABLE FOR AT LEAST ONE TAKEOFF AND LANDING WITH LITTLE LOSS OF PNEUMATIC CHARACTERISTICS ONCE THE TIRE CASING HAS BEEN VIOLATED. THE RUN-FLAT UNIT WILL BE AN INSERT TYPE WHICH FITS TIGHTLY ON THE WHEEL USING A PATENTED TWO-PIECE DESIGN. THE DEVICE WILL BE A MOLDED ADVANCED TECHNOLOGY PRODUCT MADE OF POLYESTER ELASTOMERS. THIS MATERIAL HAS HIGH STRENGTH, IS ENERGY ABSORBING AND LIGHTWEIGHT WITH STABILITY OVER A WIDE TEMPERATURE RANGE. THE TECHNOLOGY TO BE USED IS THAT WHICH HAS PRODUCED RUN-FLAT SYSTEMS THAT HAVE SUCCESSFULLY COMPLETED RIGOROUS TESTING BY THE MILITARY AND PRIVATE SOURCES.

S LEVY INC
3425 S BASCOM AVE
CAMPBELL, CA 95008
CONTRACT NUMBER: F29601-87-C-0043
DAVOOD ABDOLLAHIAN
TITLE:
STUDY OF TWO-PHASE FLOW AND HEAT TRANSFER IN MICROGRAV
TOPIC# 200 OFFICE: AFWL/PRC

SUBMITTED BY

DESIGN OF THE TWO-PHASE FLOW SYSTEMS WHICH ARE ANTICIPATED TO BE UTILIZED IN FUTURE SPACECRAFT AND SATELLITES WILL REQUIRE A KNOWLEDGE OF THE TWO-PHASE FLOW AND HEAT TRANSFER PARAMETERS UNDER REDUCED GRAVITY CONDITIONS. THE PROPOSED RESEARCH PROGRAM IS AIMED AT STUDYING THE PROBLEM OF TWO-PHASE FLOW AND HEAT TRANSFER IN MICROGRAVITY AND TO DEVELOP A TEST PLANT FOR AN EXPERIMENTAL PROGRAM TO EXTEND AND CLARITY THE KNOWLEDGE OF THE IMPORTANT PARAMETERS IN THIS FIELD. THE PROJECT OBJECTIVES WILL BE ACHIEVED BY (1) ANALYZING THE EXISTING DATA AND MODELS; (2) IDENTIFYING THE AREAS WHICH REQUIRE MORE TESTING; (3) STUDYING THE INSTRUMENTATION AND METHOD OF TESTING USED IN BOTH REDUCED AND EARTH GRAVITY EXPERIMENTS; (4) DEVELOPING A TEST PLAN AND PROCEDURE FOR THE PROPOSED EXPERIMENTS TO BE DESIGNED IN PHASE II. IN ADDITION TO THE MAIN OUTCOME OF THE PROJECT, THE WORK PLAN WILL RESULT IN A DATA BASE OF EXISTING EXPERIMENTAL RESULTS FOR THE TWO-PHASE FLOW PARAMETERS, A SET OF WORKING RELATIONS WHICH CAN BE USED IN THE DESIGN AND SELECTION OF THE HARDWARE, AND GUIDELINES FOR DEVELOPING INSTRUMENTATION FOR THE TWO-PHASE PARAMETERS IN MICROGRAVITY.

S-TRON
101 TWIN DOLPHIN DR
REDWOOD CITY, CA 94065
CONTRACT NUMBER:
O'DELL M KEIL
TITLE:
SENSOR-AUGMENTED VISION SYSTEM
TOPIC# 85 OFFICE: AMD/RDO

PRESENTLY AVAILABLE NIGHT VISION GOGGLES (NVG) ARE NOT MATCHED TO THE NEEDS OF TACTICAL AIR CREW MEMBERS. THEY SERIOUSLY LIMIT EFFECTIVENESS OF THE AVIATOR BY INTERFERING WITH PERIPHERAL VISION, HEAD-DOWN INSTRUMENT READABILITY, HEAD-UP DISPLAY, AND DEPTH PERCEPTION. THE VIEW HAS BEEN LIMITED TO A NARROW 40 DEG FIELD. THEY ARE HAZARDOUS IN HIGH-G OR IN THE WIND BLAST AT EJECTION. THEY CANNOT BE GAIN-ADJUSTED AND THEY BECOME SATURATED FROM ONE'S OWN GUN MUZZLE FLASH. S-TRON PROPOSES TO INTEGRATE SENSORS IN THE AVIATOR'S BODY ENVIRONMENT, SEEKING TO MATCH A NEW ELECTRO-OPTICAL DISPLAY AND HELMET TO THE NEEDS OF THE TACTICAL AVIATOR AND THE EXISTING CAPABILITIES OF HIS SENSOR ARRAY. PROPOSED AREAS OF IMPROVEMENT INCLUDE RESTORING

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AND ENHANCING DEPTH PERCEPTION, MUZZLE FLASH SUPRESSION, DISPLAY FLIR AND COMPUTER-GENERATED 3-D SYMBOLOGY. COCKPIT INSTRUMENTS SHOULD APPEAR NORMAL; STRAIGHT-AHEAD AND PERIPHERAL NORMAL VISION SHOULD BE LIMITED ONLY BY PRESENT HELMET AND AIRCRAFT STRUCTURE. THE SYSTEM PROTECTS AGAINST MECHANICAL AND OPTICAL HAZARDS, HIGH-G AND EJECTION, AND PROTECTS THE AVIATOR DOWN TO AND ON THE GROUND. LIMITED EQUIPMENT MOCKUP AND OPTICAL DESIGN IS PROPOSED; PHASE I IS PRIMARILY AN ASSESSMENT OF AVIATOR NEEDS, TECHNOLGY OPTIONS AND DOD POLICIES, AND LEADS TO THE PHASE II HARDWARE DEMONSTRATION.

SAM TECHNOLOGY INC
1855 FOLSOM ST - RM 610
SAN FRANCISCO, CA 94103
CONTRACT NUMBER: FGQ8671-8701647
NELSON H MORGAN
TITLE:
SOFTWARE TOOLS FOR NEURAL NETWORK SIMULATORS
TOPIC# 241 OFFICE: AFOSR/XOT

WE PROPOSE TO DEVELOP A HIGHLY PORTABLE SET OF C LANGUAGE SOFTWARE TOOLS FOR NN RESEARCH. THE SOFTWARE TOOLS WILL ALLOW SPECIFICATION OF THREE GENERIC TYPES OF NN ARCHITECTURES: (1) LAYERED NETWORKS WITHOUT FEEDBACK (FOR BENCHMARK COMPARISONS); (2) LAYERED NETWORKS WITH FEEDBACK BUT WITHOUT OSCILLATION; AND (3) OSCILLATORY NETWORKS. TO FACILITATE NN ALGORITHM DEVELOPMENT AND EVALUATION, A DATA SET SIMULATOR WILL ALLOW SPECIFICATION OF MULTI-CLASS TEST DATA WITH USER-SPECIFIED TIME-VARYING SIGNAL AND NOISE CHARACTERISTICS.

SAM TECHNOLOGY INC
1855 FOLSOM ST - RM 610
SAN FRANCISCO, CA 94103
CONTRACT NUMBER:
NELSON H MORGAN
TITLE:
FLIGHT HELMET EEG SYSTEM
TOPIC# 77 OFFICE: AMD/RDO

THE AIM OF THE PROPOSED WORK IS TO DEVELOP A HELMET-MOUNTED EEG

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RECORDING SYSTEM FOR USE IN SIMULATORS OR DURING FLIGHT. THE SYSTEM WILL HAVE VERY HIGH NOISE IMMUNITY AND WILL BE VERY SIMPLE TO APPLY. TO ACCOMPLISH THIS, WE WILL ADAPT A DESIGN WE HAVE MADE FROM AN ACTIVE ELECTRODE SYSTEM FOR CLINICAL EEG RECORDINGS. THE SYSTEM WILL SUPPORT UP TO 64 CHANNELS. THE PHASE I PROJECT WILL BE A FEASIBILITY STUDY TO DETERMINE HOW TO RUGGEDIZE THE CLINICAL DESIGN AND OTHERWISE CONVERT IT FOR USE IN THE SIMULATOR AND COCKPIT ENVIRONMENTS.

SAT-CON TECHNOLOGY CORP
71 ROGERS ST
CAMBRIDGE, MA 02142
CONTRACT NUMBER:
DAVID B EISENHAUSE
TITLE:
DISTRIBUTED MAGNETIC ACTUATORS FOR FINE SHAPE CONTROL
TOPIC# 191 OFFICE: AFRPL/TSTR

NEW SPACECRAFT DESIGNS FEATURE LARGE STRUCTURES CHARACTERIZED BY LOW NATURAL FREQUENCIES, LIGHTLY DAMPED STRUCTURAL MODES, AND STRINGENT SHAPE CONTROL REQUIREMENTS. THESE LARGE SPACE STRUCTURES (LSS) POSE UNIQUE AND DIFFICULT CONTROL PROBLEMS. AN IMPORTANT PART OF THE SOLUTIONS TO THESE CONTROL PROBLEMS IS THE DEVELOPMENT OF ACTUATORS THAT ALLOW THE APPLICATION OF FORCE AND OR TORQUE TO THE SPACE STRUCTURE. THIS PROPOSED RESEARCH PROGRAM WILL EXAMINE ADVANCED DISTRIBUTED LSS SHAPE CONTROL USING AN ARRAYS OF MAGNETIC COILS FIXED TO THE STRUCTURE. EACH COIL WILL PROVIDE SIX-DEGREE-OF-FREEDOM ACTUATION (FORCES IN AN TORQUES ABOUT THREE ORTHOGONAL AXES) WHEN IT INTERACTS WITH OTHER COILS IN THE ARRAY. THIS ACTUATION SCHEME IS EXPECTED TO HAVE A NUMBER OF ADVANTAGES OVER CONVENTIONAL ACTUATORS INCLUDING DC FORCE CAPABILITY, HIGH BANDWIDTH, EXTREMELY LOW MASS, AND NO MOMENTUM SATURATION EFFECTS. THE PROPOSED RESEARCH PROGRAM WILL DEVELOP THESE ACTUATORS AND ASSESS THEIR PERFORMANCE COMPARED TO CONVENTIONAL ACTUATORS.

SAXPY COMPUTER CORP
255 SAN GERONIMO WY
SUNNYVALE, CA 94086
CONTRACT NUMBER:
B FRIEDLANDER
TITLE:
TECHNIQUES FOR REDUCING COMPUTATIONAL REQUIREMENTS FOR PROCESSING
TOPIC# 239 OFFICE: BMO/MYSC

SUBMITTED BY

HIGH RESOLUTION SAR PROCESSING REQUIRES A LARGE AMOUNT OF COMPUTATIONS. THESE COMPUTATIONAL REQUIREMENTS CAN BE REDUCED AT THE COST OF REDUCED SYSTEM PERFORMANCE. THE OBJECTIVES OF THIS PROJECT ARE TWOFOLD: (i) TO DEVELOP A NUMBER OF TECHNIQUES FOR REDUCING THE COMPUTATION REQUIREMENTS, INCLUDING: SUB-ARRAY AND THINNED-ARRAY PROCESSING, COARSE QUANTIZATION, AND RANGE PRE-PREPROCESSING; (ii) TO STUDY THE TRADEOFF OF PERFORMANCE (P(D), P(FA), AND RESOLUTION) VS. COMPUTATIONS FOR EACH OF THESE TECHNIQUES. A SET OF TRADEOFF CURVES WILL BE DEVELOPED USING A COMBINATION OF ANALYSIS AND COMPUTER SIMULATION.

SCEEE SERVICES CORP (SSC)
1101 MASSACHUSETTS AVE
ST CLOUD, FL 32769
CONTRACT NUMBER:
GRANT E SECRIST
TITLE:
SITUATIONAL AWARENESS TRAINING
TOPIC# 80 OFFICE: AMD/RDO

THE AERIAL COMBAT DATA FROM WORLD WAR II AND ALL SUBSEQUENT ARMED CONFLICTS CONVINCINGLY DEMONSTRATE THAT TACTICAL MISSION EFFECTIVENESS HINGES ON THE EXCEPTIONAL PERFORMANCE OF A VERY FEW TRULY SUPERIOR PILOTS. THESE FEW TRULY SUPERIOR PILOTS HAVE IDENTIFIABLE CHARACTERISTICS THAT DISTINGUISH THEM FROM THEIR LESS SUCCESSFUL CONTEMPORARIES. AN EXTRA-ORDINARILY KEEN SITUATIONAL AWARENESS IS PARTICULARLY CRUCIAL TO SUPERIOR AIR COMBAT PERFORMANCE AND, ADDITIONALLY, POSITIVELY INFLUENCES OTHER CRITICAL PERFORMANCE FACTORS. A SITUATIONAL AWARENESS TRAINING SYSTEM IS PROPOSED THAT FOCUSES ON UNDERDEVELOPED AND UNEXPLOITED COGNITIVE AND AWARENESS CAPABILITIES. THE TRAINING APPROACH IS BASED ON THE DEVELOPMENT AND ENHANCEMENT OF SITUATIONAL AWARENESS AND RELATED COGNITIVE PROCESSES. LABORATORY EXPERIMENTS WILL BE CONDUCTED TO ASCERTAIN THE EXTENT TO WHICH THE DEVELOPMENT AND ENHANCEMENT OF HEIGHTENED AWARENESS AND ASSOCIATED COGNITIVE PROCESSES EXPAND THE VISUAL FIELD AND TRANSLATE INTO IMPROVED PERFORMANCE IN TARGET DETECTION, RECOGNITION, IDENTIFICATION, AND MANEUVERING DISCRIMINATION.

SCHAFER W J ASSOCS IN
20501 VENTURA BLVD - STE 270
WOODLAND HILLS, CA 91364
CONTRACT NUMBER: F29601-87-C-0045
JEFFREY B SHELLAN
TITLE:
DESIGN OF AN ADVANCED OPTICAL PHASED ARRAY SURVEILLANC
TOPIC# 193 OFFICE: AFWL/PRC

SUBMITTED BY

THE PURPOSE OF THIS PROGRAM WILL BE TO DESIGN AN ADVANCED OPTICAL PHASED ARRAY SURVEILLANCE SYSTEM, BASED ON DEMONSTRATED OPTICAL TECHNOLOGY, CAPABLE OF SATISFYING A RAYLEIGH TWO POINT RESOLUTION CRITERION OF 0.25 METER AT A DISTANCE OF 5,000 km FOR VISIBLE LIGHT ILLUMINATION (APPROX " 0.5 MICOMETER). CONVENTIONAL SINGLE APERTURE DESIGNS WOULD REQUIRE A TELESCOPE APERTURE 12 METERS IN DIAMETER. A COMPACT PHASED ARRAY OF DEMONSTRATED HUBBLE SPACE TELESCOPES, 2.4 METERS IN DIAMETER, WOULD REQUIRE 24 TELESCOPES, BUT WOULD BE UNNECESSARILY EXPENSIVE. IN THIS PROPOSAL A SPARSE/CODED APERTURING CONCEPT USING ONLY SIX HUBBLE SIZED PRIMARIES WILL BE DESIGNED. THE IMAGE PROCESSING ALGORITHM FOR REMOVING THE EFFECTS OF RESIDUAL CLASSICAL ABERRATIONS SUCH AS PISTON, FOCUS, SPHERICAL ABERRATION, AS WELL AS UNCONTROLLED HIGH FREQUENCY JITTER, USING A STAR CALIBRATION OR REAL TIME IMAGE SHARPENING ALGORITHM WILL BE EVALUATED. COMPENSATORY MISALIGNMENT AND MISFOCUS, DESIGNED TO AID THE FILTER FUNCTION CORRECTION OF HIGHER ORDER ABERRATION, WHILE MINIMIZING NOISE GAIN (NG) WILL BE INVESTIGATED.

SCHAFER W J ASSOCS INC
321 BILLERICA RD
CHELMSFORD, MA 01824
CONTRACT NUMBER:
RAYMOND F WALSH IV
TITLE:
KINETIC ENERGY WEAPONS COUNTERMEASURES
TOPIC# 233 OFFICE: BMO/MYSC

THIS STUDY WILL DEVELOP STRATEGIES AND CONCEPTS FOR BALLISTIC MISSILE MANEUVERING WHICH WILL INCREASE THE PROBABILITY OF SURVIVAL WHEN ATTACKED BY A KINETIC ENERGY WEAPON (KEW). ANALYSIS WILL DETERMINE HOW TO MINIMIZE BOOSTER MANEUVER REQUIREMENTS WHILE MAXIMIZING KEW MANEUVER REQUIREMENTS. THE IMPACT ON BOOSTER WEIGHT AND PAYLOAD, AND ON KEW SYSTEM WEIGHT AND COST WILL BE QUANTIFIED.

SCHWARTZ ELECTRO-OPTICS INC
45 WINTHROP ST
CONCORD, MA 01742
CONTRACT NUMBER:
DR PETER F MOULTON
TITLE:
SOLID STATE LASERS FOR EYE-SAFE COHERENT LIDAR
TOPIC# 181 OFFICE: AFGL/XOP

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THE EFFORT PROPOSED HERE WILL INVESTIGATE THE FEASIBILITY OF DEVELOPING DIODE-PUMPED, SOLID STATE LASERS FOR USE IN SPACE-BASED, EYE-SAFE COHERENT LIDAR SYSTEMS. THE WORK WILL INCLUDE A THOROUGH THEORETICAL STUDY OF THREE POTENTIAL RARE-EARTH LASER IONS, ERBIUM, HOLMIUM AND THULIUM, AND WILL INCLUDE EXPERIMENTATION WITH THE ION CHOSEN AS THE BEST CANDIDATE FOR PRACTICAL SPACE-BASED SYSTEMS.

SCIENCE & ENGINEERING ASSOCS INC
PO BOX 3722
ALBUQUERQUE, NM 87190
CONTRACT NUMBER: F33615-87-C-3406
WILLIAM S RIPPI
TITLE:
FIGHTER COCKPIT INGRESS IN CHEMICAL WARFARE ENVIRONMEN
TOPIC# 117 OFFICE: AFWAL/FI

EXPOSURE OF PERSONNEL AND HARDWARE TO NBC CONTAMINANTS IS A CRITICAL PROBLEM IN MANY WARFARE SCENARIOS. ALTHOUGH SEVERAL CURRENT NBC PROTECTION TECHNIQUES EXIST AND MAY SATISFACTORILY PROTECT PERSONNEL AND HARDWARE IN MANY CIRCUMSTANCES, A METHOD IS REQUIRED THAT ENABLES FLIGHT CREWS TO EXPEDIENTLY INGRESS/EGRESS AN AIRCRAFT COCKPIT WHILE IN A CONTAMINATED FLIGHT LINE ENVIRONMENT. IT MUST ALLOW PROTECTION FOR BOTH THE CREW AND HARDWARE THROUGHOUT THE INGRESS/EGRESS ACTIVITY. IN ADDITION, BECAUSE OF THE STRINGENT PERFORMANCE REQUIREMENTS PLACED ON THE CREW, IT IS HIGHLY DESIRABLE THAT THEY BE ABLE TO PERFORM WITHIN A "SHIRT SLEEVE" ENVIRONMENT. THE USE OF A MODULAR CREW ESCAPE CPSULE, DESIGNED TO BE EASILY REMOVED AND REPLACED INTO ITS HOST AIRFRAME IS PROPOSED. THE OCCUPIED CAPSULE CAN BE INSTALLED BY ROBOTIC EQUIPMENT, NEVER EXPOSING THE CREW OR SUPPORT PERSONNEL TO THE DEADLY NBC CONTAMINANTS.

SCIENCE & ENGINEERING ASSOCS INC
PO BOX 3722
ALBUQUERQUE, NM 87190
CONTRACT NUMBER:
DR BRIAN G STEPHAN
TITLE:
TARGET DAMAGE ASSESSMENT BY BALLISTICALLY DELIVERED SE
TOPIC# 217 OFFICE: BMO/MYSC

SUBMITTED BY

THIS PHASE I STUDY WOULD BEGIN WITH AN OPERATIONAL REQUIREMENTS MATRIX INCLUDING: WORLD SETTING; MISSIONS; MISSION PHASES; OBJECTIVES; TARGET "SIGNATURE"; PAYLOAD REQUIREMENTS; SENSOR REQUIREMENTS AND SURVIVABILITY REQUIREMENTS. MISSIONS WOULD INCLUDE DAMAGE ASSESSMENT, DAMAGE ASSESSMENT/STRIKE, AND "SPECIAL SENSORS". MISSIONS AND CONCEPTS OF OPERATION WOULD BE VALIDATED WITH SPONSOR AND STRATEGIC AIR COMMAND. THE ROLE OF "SPECIAL SENSORS" IN CONJUNCTION WITH SICBM WEAPONS AGAINST STRATEGIC RELOCATABLE TARGETS (SRTs) WOULD BE CAREFULLY EXAMINED. DATA FROM ON-GOING BMO PRDA SRT EFFORTS (MISSION TIMELINES, VIEWING GEOMETRIES, SENSOR CAPABILITIES, PAYLOAD CONSTRAINTS, ETC.) WILL BE EXTREMELY USEFUL TO THIS STUDY AND ALLOW US TO FOCUS ON MISSION EFFECTIVENESS WITHOUT INVESTIGATING A LARGE AMOUNT OF TIME TO ACQUIRE BACKGROUND DATA.

SCIENCE & ENGINEERING ASSOCS INC
612 OLD SANTA FE TRAIL
SANTA FE, NM 87501
CONTRACT NUMBER: F33615-87-C-5318
BOB WALSH
TITLE:
CIRCUIT BASE - A RELATIONAL APPROACH TO INTEGRATING SY
ENGINEERING AND RAM/CAD/CAE
TOPIC# 90 OFFICE: AMD/RDO

INVESTIGATION OF THE APPLICABILITY OF THE CIRCUIT BASE CONCEPT IS HEREIN PROPOSED. THE CIRCUIT BASE CONCEPT IS A RELATIONAL DATABASE METHODOLOGY FOR INTEGRATING CAD/CAE SOFTWARE AND FOR MANAGING ELECTRONIC SYSTEMS ENGINEERING DATA. IT IS INNOVATIVE IN THE USE OF A RELATIONAL APPROACH, IN INCLUDING SYSTEMS CONFIGURATION AND ENGINEERING DATA, AND IN INTERFACING WITH RELIABILITY AND OTHER SYSTEMS ENGINEERING SOFTWARE. CIRCUIT BASE INTERFACES CAD/CAE TASKS IN SUCH A MANNER THAT THE DESIGN ENGINEER DOES NOT HAVE TO RE-DESCRIBE THE SCHEMATIC FOR EACH APPLICATION PROGRAM. INSTEAD, THE CIRCUIT BASE SOFTWARE ENTERS RESULTS FROM ONE PROGRAM INTO THE DATABASE AND EXTRACTS CORRECTLY FORMATTED INPUT FILES TO THE NEXT PROGRAM. IMPLEMENTING THESE MODULES IN A RELATIONAL DBMS LANGUAGE GIVES MANAGEMENT CONTROL OVER ENGINEERING PROJECT DATA. THE PHASE I EFFORT WILL ADDRESS THE MOST UNCERTAIN ASPECT OF THE INNOVATION - WHETHER THE DATABASE CONCEPT IS ADEQUATE TO ACCOMMODATE ALL OF THE DATA NEEDS OF

SUBMITTED BY

THE VARIOUS CAE PROCEDURES. THEREFORE IT WILL CONCENTRATE ON THE ANALYSIS OF THE ENGINEERING DATA REQUIREMENTS AND SPECIFICATION OF THE DATA DICTIONARIES.

SCIENTIFIC RADIO SYSTEMS INC
367 ORCHARD ST
ROCHESTER, NY 14606
CONTRACT NUMBER: F19628-87-C-0171
JACOB Z SCHANKER
TITLE:
METEOR BURST COMMUNICATIONS (MBC) THROUGHPUT IMPROVEME
TOPIC# 34 OFFICE: ESD/XR

THE EXISTING LITERATURE ON METEOR BURST SYSTEMS IS WIDELY DISPERSED, INCONVENIENT TO OBTAIN AND OFTEN EITHER TOO THEORETICALLY ORIENTED OR TOO SIMPLIFIED TO BE USEFUL TO SYSTEM PLANNERS AND USERS. CONSEQUENTLY, SYSTEM PERFORMANCE MAY BE BELOW EXPECTATIONS. THERE IS A CLEAR NEED FOR AN AUTHORITATIVE, COMPREHENSIVE HANDBOOK OF METEOR BURST SYSTEM PLANNING, DESIGN, INSTALLATION AND OPERATION. THE PROPOSED STUDY WILL PREPARE A METEOR BURST SYSTEM USER'S HANDBOOK WHICH, WHILE AUTHORITATIVE, WILL BE WRITTEN IN A CLEAR, OPEN STYLE TO MAKE IT ACCESSIBLE AND USEFUL TO THE READER. THE HANDBOOK WILL BE SUPPLEMENTED BY SEVERAL COMPUTER PROGRAMS WHICH WILL FACILITATE CALCULATION DEMONSTRATED AVAILABLE TRADE-OFFS. THE PROGRAM WILL BE WRITTEN IN BASIC, AND THE DISKS PROVIDED WILL BE FOR IBM PC AND COMPATIBLE COMPUTERS. THE STUDY WILL DRAW ON THE EXISTING LITERATURE AS WELL AS UNPUBLISHED DOCUMENTS AND THE EXPERIENCE GAINED BY THE PROPOSER IN OPERATING METEOR BURST LINKS OVER A PERIOD OF FIVE YEARS. TECHNIQUES TO IMPROVE SYSTEM THROUGHPUT WILL BE INVESTIGATED AND WILL BE EMPHASIZED.

SCIENTIFIC RESEARCH ASSOCS INC
PO BOX 1058
GLASTONBURY, CT 06033
CONTRACT NUMBER: FQ8671-8701405
DR BRIAN E THOMPSON
TITLE:
HOT-BLOCK ANEMOMETRY
TOPIC# 241 OFFICE: AFOSR/XOT

SUBMITTED BY

RESEARCH AND DEVELOPMENT OF A MAJOR INNOVATION IN FLOW MEASURMENT, CALLED HOT-BLOCK ANEMOMETRY, IS PROPOSED FOR MEASURING FLUID VELOCITY. MEASUREMENT OF VELOCITY CHARACTERISTICS IN COMPLEX AND UNSTEADY FLOWS IS A PROBLEM OF GREAT PRACTICAL IMPORTANCE. HOT-BLOCK ANEMOMETRY IS PROPOSED TO EXTEND CURRENT CAPABILITY AND TO PROVIDE INSTANTANEOUS VALES OF FLOW SPEED AND DIRECTION IN THE COMPLETE RANGE FROM SIMPLE, LAMINA FLOWS TO COMPLEX, TURBULENT FLOWS. HOT BLOCK ANEMOMETRY IS AN EXTENSION OF WELL-ESTABLISHED THERMAL ANEMOMETRY AND HAS RESULTED IN PART FROM RECENT DEVELOPMENTS IN MICROCOMPUTER AND SURFACE-COATING TECHNOLOGIES. HOT-BLOCK ANEMOMETRY WILL PROVIDE CONTINUOUS AND SIMULTANEOUS MEASUREMENT OF ALL THREE VELOCITY COMPONENTS IN UNSTEAD FLOWS AND IN A WIDE RANGE OF TURBULENT FLOWS. MEAN AND TURBULENT QUANTITIES OBTAINED WITH HOT-BLOCK ANEMOMETRY SHOULD BE MORE ACCURATE THAN THOSE OBTAINED WITH 5-HOLE IMPACT PROBES OR HOT-WIRE ARRAYS AND MUCH LESS EXPENSIVE THAN THOSE OBTAINED WITH LASER VELOCIMETRY. THE PHASE I FEASIBILITY STUDY WOULD PROVIDE A DESIGN, AND AN ASSESSMENT OF MANUFACTURABILITY OF A HOT-BLOCK PROBE. PHASE II WOULD DEVELOP A PROTOTYPE PROBE, AN ASSOCIATED DATA-ACQUISITON SYSTEM AND SOFTWARE PACKAGE, AND WOULD PROVIDE A COMPLETE PROTOTYPE INSTRUMENT. PHASE III WOULD DEVELOP A MARKETABLE PRODUCT, THE HOT-BLOCK ANEMOMETRY SYSTEM AND PROBES, IN PREPARATION FOR COMMERCIAL SALES. THE PROPOSED EFFORT, IF SUCCESSFUL, WOULD PROVIDE AN INNOVATIVE INSTRUMENT AND ESTABLISH TECHNIQUES FOR ITS USE.

SCIENTIFIC RESEARCH ASSOCS INC
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GLASTONBURY, CT 06033
CONTRACT NUMBER: FQ8671-8701406
HAROLD L GRUBIN
TITLE:
NUMERICAL SIMULATION OF THE FUNCTION OF SCIENTIFIC INS
FOR MEASURING THE SPEED OF ELECTRON DEVICES
TOPIC# 241 OFFICE: AFOSR/XOT

ONE OF THE KEY ISSUES FACING ELECTRONIC DEVICES IS DETERMINING THEIR SPEED. THEORY PREDICTS THAT NONEQUILIBRIUM EFFECTS IN DEVICES SHOULD IMPROVE THE SPEED OF SOME DEVICES BY UPWARDS OF A FACTOR OF FIVE. THE DIFFICULTY LIES IN FINDING NONEVASIVE EXPERIMENTAL TECHNIQUES THAT ISOLATE THIS PHENOMENA, PARTICULARLY WHEN CHARGE REARRANGEMENT

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(CAPACITIVE EFFECTS) IN DEVICES OCCUR ON TIME SCALES THAT APPROACH THE SPEEDS BEING SOUGHT. THIS DOCUMENT DESCRIBES THE FIRST APPLICATION OF NUMERICAL SIMULATION PROCEDURES TO ASSIST IN FINDING NONEVASIVE SCIENTIFIC INSTRUMENTATIVE FOR MEASURING THE SPEED OF ELECTRONIC DEVICES. IN THIS PHASE I PROGRAM THE FEASIBILITY OF PERFORMING THESE STUDIES IS TO BE ESTABLISHED THROUGH NUMERICAL SIMULATIONS THAT SCRUTINIZE AUSTONS TECHNIQUE FOR MEASURING THE RESPONSE OF ELECTRON DEVICES. THE DEVICES TO WHICH THIS SIMULATION IS TO BE APPLIED ARE TWO NEW DEVICES, THE VERTICAL HEMT AND THE PSEUDO-MORPHIC HEMT.

SENSOR DATA INTEGRATION INC
342 CATERINA HIGHTS
CONCORD, MA 01742
CONTRACT NUMBER: F19628-87-C-0183
DR SAM CHAUDHURI
TITLE:
ARTIFICIAL INTELLIGENCE APPLICATIONS TO COMMAND CONTRO
COMMUNICATIONS SYSTEMS/SUBSYSTEMS
TOPIC# 36 OFFICE: ESD/XR

THE KNOWLEDGE-BASED EXPERT SYSTEM (KBES) FOR AIR FORCE'S COMMAND, CONTROL, AND COMMUNICATIONS (C3) SYSTEMS REQUIRES THE COOPERATIVE INTERACTION OF DISTRIBUTED COMMUNITIES OF EXPERT SYSTEMS SUPPORTING BOTH TACTICAL AND STRATEGIC MILITARY OPERATIONS. THIS PROPOSED STUDY WILL ADDRESS THE DEVELOPMENT OF INTEGRATED TARGET TRACKING AND IDENTIFICATION SYSTEM THAT CAN INCREASE AUTOMATION IN THE FORM OF INNOVATIVE SIGNAL PROCESSING, SENSOR DATA FUSION AND KNOWLEDGE-BASED EXPERT SYSTEM SOFTWARE TO REDUCE A BATTLE COMMANDER'S WORKLOAD AND TO ENHANCE THE TOTAL SYSTEM PERFORMANCE AND RELIABILITY. THIS RESEARCH WILL FOCUS ON KNOWLEDGE REPRESENTATION TECHNIQUES, IMPROVE TECHNIQUES FOR DEVELOPING KNOWLEDGE BASES, AND IMPROVE KNOWLEDGE METHODOLOGIES FOR DEVELOPING THE C3 KBES. THE STUDY WILL ALSO RECOMPASS HIGH SPEED DATABASE SEARCH TECHNIQUES, SELF-LEARNING AND INTERACTIVE ENVIRONMENT, IMPROVED MAN-MACHINE INTERFACES, AND TECHNIQUES FOR REASONING FROM EVIDENCE THAT MAY BE INACCURATE, INCOMPLETE, INCORRECT AND TIME-VARIANT. ENHANCED INFERENCE ENGINE ARCHITECTURE AND EXPLANATION CAPABILITIES OF THE C3 KBES WILL ALSO BE ADDRESSED.

SIGMA RESEARCH CORP
394 LOWELL ST - STE 12
LEXINGTON, MA 02173
CONTRACT NUMBER:
STEVEN R HANNA
TITLE:
HAZARD RESPONSE MODELING UNCERTAINTY
TOPIC# 66 OFFICE: AFESC/RDXP

SUBMITTED BY

THERE ARE CURRENTLY AVAILABLE MANY MICROCOMPUTER-BASED HAZARD RESPONSE MODELS FOR CALCULATING CONCENTRATIONS OF HAZARDOUS CHEMICALS IN THE ATMOSPHERE. THE UNCERTAINTIES ASSOCIATED WITH THESE MODELS ARE NOT WELL-KNOWN AND THEY HAVE NOT BEEN ADEQUATELY EVALUATED AND COMPARED USING STATISTICAL PROCEDURES WHERE CONFIDENCE LIMITS ARE DETERMINED. THE U.S. AIR FORCE HAS A NEED FOR AN OBJECTIVE METHOD FOR EVALUATING THESE MODELS, AND THE PROPOSED RESEARCH WILL PROVIDE A FRAMEWORK FOR PERFORMING THESE ANALYSES AND ESTIMATING THE MODEL UNCERTAINTIES. AS PART OF THIS RESEARCH, AVAILABLE MODELS AND DATA SETS WILL BE COLLECTED, METHODS FOR ESTIMATING UNCERTAINTIES DUE TO DATA INPUT ERRORS AND STOCHASTIC EFFECTS WILL BE DEVELOPED, A FRAMEWORK FOR MODEL EVALUATION WILL BE PUT TOGETHER, AND PRELIMINARY APPLICATIONS USING TEST DATA SETS WILL TAKE PLACE.

SIMULA INC
10016 - S 51ST ST
PHOENIX, AZ 85044
CONTRACT NUMBER:
JOSEPH W COLTMAN
TITLE:
INVESTIGATION OF COMPOSITE MATERIALS FOR MANIKIN SKELE
TOPIC# 87 OFFICE: AMD/RDO

MANIKINS ARE CURRENTLY FABRICATED WITH A SKELETON OF METAL "BONES" WHICH PROVIDE THE STRUCTURAL STRENGTH REQUIRED TO WITHSTAND THE REPEATEDLY HIGH ACCELERATIONS AND LOADS OF DYNAMIC TESTING. SUCH METAL STRUCTURES, HOWEVER, DO NOT EXHIBIT PROPER SEGMENT INERTIAL DISTRIBUTION OR LOAD-DEFORMATION PROPERTIES, WHICH MAKES IT DIFFICULT TO DESIGN MANIKINS FOR BIOFIDELIC RESPONSE. FOR THIS REASON, IT IS PROPOSED TO INVESTIGATE THE FEASIBILITY OF USING COMPOSITE MATERIALS FOR SPECIFIC STRUCTURAL ELEMENTS OF THE MANIKIN. SUCH MATERIALS HAVE HIGHER STIFFNESS-TO-WEIGHT AND STRENGTH-TO-WEIGHT RATIOS AND HAVE MORE BONE-LIKE DEFORMATION PROPERTIES THAN THE CURRENTLY USED METAL PARTS. THE OBJECTIVES OF THIS PHASE I EFFORT ARE TO FIRST EVALUATE PROBLEM AREAS IN THE SKELETAL STRUCTURES OF TEST MANIKINS, AND TO ANALYZE HUMAN SKELETAL PROPERTIES. A CONCEPT FOR A SINGLE MANIKIN SEGMENT, THE FEMUR, WILL THEN BE DEVELOPED, FOLLOWED BY FABRICATION OF A PROTOTYPE. THE FEASIBILITY OF REPLACING THE REMAINING METALLIC COMPONENTS WITH COMPOSITE PARTS WILL ALSO BE EXAMINED.

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SMART SYSTEMS TECHNOLOGY
7700 LEESBURG PIKE
FALLS CHURCH, VA 22043
CONTRACT NUMBER: F33615-87-C-2169
CRAIG WILL
TITLE:
ARTIFICIAL INTELLIGENCE APPLIED TO AERONAUTICAL SYSTEM
TOPIC# 162 OFFICE: ASD/XR

THE GOAL OF THIS PROJECT IS TO DEVELOP TECHNIQUES FOR COMPUTER SPEECH RECOGNITION USING PARALLEL DISTRIBUTED PROCESSING MODELS. THESE MODELS ARE BASED UPON THEORIES OF HUMAN COGNITIVE PROCESSING AND HAVE SEVERAL USEFUL PROPERTIES. THEY ARE VERY EFFECTIVE AND EFFICIENT AT INTEGRATING TOGETHER IMPRECISE INFORMATION, AND THUS FOR INTEGRATING MULTIPLE SOURCES OF KNOWLEDGE FOR SPEECH RECOGNITION. THEY CAN ORGANIZE THEMSELVES AS THE RESULT OF EXPERIENCE, AND THUS LEARN TO USE SPEECH MECHANISMS FOR RECOGNITION THAT ARE ONLY POORLY UNDERSTOOD. THEY ARE NATURALLY PARALLEL AND ESPECIALLY SUITED FOR MASSIVELY PARALLEL MACHINE ARCHITECTURES, AND ARE ALSO RELATIVELY INSENSITIVE TO DAMAGE TO MACHINE HARDWARE. THESE PROPERTIES ALLOW SPEECH RECOGNITION SYSTEMS TO BE BUILT THAT CAN MAKE USE OF SPEECH INFORMATION THAT IS DIFFICULT TO DO WITH CONVENTIONAL SYMBOLIC COMPUTATION. THEY ALSO ALLOW SYSTEMS THAT CAN OPERATE IN HARSH ENVIRONMENTS SUCH AS THAT OF A MILITARY AIRCRAFT. THIS PROJECT INVESTIGATES ARTIFICIAL INTELLIGENCE ARCHITECTURES FOR COMPUTER SPEECH RECOGNITION BASED UPON THESE MODELS, BY TRAINING A MODEL RECOGNITION SYSTEM, EVALUATING ITS PERFORMANCE, AND ANALYZING THE ORGANIZATIONAL STRUCTURE IT DEVELOPS.

SOFTWARE ARCHITECTURE & ENGINEERING
1600 WILSON BLVD - STE 500
ARLINGTON, VA 22209
CONTRACT NUMBER:
DR AMIR RAZI
TITLE:
TEXT UNDERSTANDING SYSTEM
TOPIC# 60 OFFICE: RADC/XPX

SUBMITTED BY

A LARGE VOLUME OF EXISTING INFORMATION IS IN THE FORM OF TEXT INCLUDING MESSAGES, ARTICLES, AND BOOKS. INFORMATION PROCESSING SYSTEMS HAVE NEGLECTED THIS SOURCE OF INFORMATION DUE TO THE LACK OF MECHANISM FOR EXTRACTING RELEVANT INFORMATION OUT OF THOSE TEXTS. INFORMATION RETRIEVAL SYSTEMS ARE MOSTLY EITHER BASED ON STATISTICAL METHODS OR BASED ON KEYWORD IN CONTEXT (KWIC) DOCUMENT RETRIEVAL WHICH BOTH LACK THE NEEDED UNDERSTANDING CAPABILITY. A "CONCEPT-BASED" MECHANISM IS PROPOSED HERE FOR EXTRACTING INFORMATION FROM A TEXT-BASE AND REPRESENTING IT IN A FORM USABLE BY AN INFORMATION PROCESSING SYSTEM. IT ALSO PROVIDES A MECHANISM FOR TEXT ABSTRACTION AND CONTROLLED PRESENTATION OF THE INFORMATION THAT IS OF INTEREST TO THE USER. THE TECHNICAL OBJECTIVE OF THE PHASE I ARE TO DEMONSTRATE THE FEASIBILITY OF THE CONCEPT-BASED APPROACH TO TEXT UNDERSTANDING.

SOFTWELL ASSOCS INC
55 CHESTER ST
CHESTER, NH 03036
CONTRACT NUMBER: F33615-87-C-5301
DR SHAHRIAR MOVAFAGHI
TITLE:
UNIFIED LIFE CYCLE ENGINEERING
TOPIC# 90 OFFICE: AMD/RDO

IN THIS PROJECT, SOFTWELL ASSOCIATES INC. SEEKS TO RESEARCH AND DEVELOP VARIOUS CONCEPTS APPLICABLE TO UNIFIED LIFE CYCLE ENGINEERING (ULCE), AND THEN TO WRITE A FUNCTIONAL SPECIFICATION FOR DEVELOPMENT OF THOSE CONCEPTS IN ULCE. CONFIGURATION MANAGEMENT PLAYS AN IMPORTANT ROLE IN THE DESIGN OF AN ULCE ENVIRONMENT. SOFTWELL ASSOCIATES INC. WILL PRODUCE CONFIGURATION MANAGEMENT PROCEDURES AND GUIDELINES SUCH THAT PROPER CONTROL AND MANAGEMENT OF DATA CAN BE MAINTAINED. SOFTWELL ASSOCIATES INC. WILL ALSO DEVELOP THE LOGICAL DESIGN FOR THE SUPPORTABILITY/PRODUCIBILITY DATABASE AFTER AN EXAMINATION AND ANALYSIS OF ULCE TOOLS AND DATA FLOW THROUGH TO OTHER ULCE TOOLS.

SORENSEN LABS
9920 E 44TH PL S
TULSA, OK 74146
CONTRACT NUMBER:
L FOWLER/D DAVIS
TITLE:
THE DEVELOPMENT OF GASEOUS FIRE SUPPRESSION AGENTS HAV
INCREASED THROW RANGE AND CONCENTRATION
TOPIC# 71 OFFICE: AFESC/RDXP

SUBMITTED BY

INCOMPLETE BUT SUBSTANTIAL RESULTS INDICATE THE SUCCESSFUL FORMULATION OF A GROUP OF COMPOSITE ADVANCED HALONS (CAH) DESIGNED TO COUPLE THE HIGHEST POSSIBLE SAFETY IN USE WITH EFFICIENCY IN OPERATION. THE CAH WOULD UTILIZE WATER OR A PROPRIETARY CARRIER AND/OR ADDITIVES WHICH ENABLE THE HALON LIQUID TO BE CONTAINED AT LOW PRESSURE AND TO HAVE A RELATIVELY HIGH BOILING POINT. THESE PHYSICAL CHARACTERISTICS RESULT IN A HEAVIER THAN AIR GASEOUS FIRE SUPPRESSION AGENT HAVING AN EFFECTIVE THROW OF SIXTY TO MORE FEET WITH INCREASE CONCENTRATION AT THE BURN-SITE SUFFICIENT TO PREVENT RE-IGNITION AND RESIST DISSIPATION BY WIND. FOR THROW RANGES APPROXIMATING 1000 FEET, AN ALTERNATE APPROACH CONSISTING OF THE MECHANICAL DELIVERY OF CAH FILLED PROJECTILES IS FEASIBLE. TOXICITY IS TOO LOW TO REPRESENT A HEALTH HAZARD.

SPACE COMPUTER CORP
PO BOX 5937
SHERMAN OAKS, CA 91413
CONTRACT NUMBER: F33615-87-C-1498
WILLIAM J JACOBI
TITLE:
THREE-DIMENSIONAL WAFER-SCALE INTERCONNECT AND PACKAGI
PHOTOSENSITIVE GLASS-CERAMIC SUBSTRATES
TOPIC# 154 OFFICE: AFWAL/AA

THE PURPOSE OF THIS PROJECT IS TO DEVELOP AND DEMONSTRATE AN INNOVATIVE NEW APPROACH TO MULTI-CHIP, WAFER-SCALE INTERCONNECT AND PACKAGING USING NEW PHOTOIMAGEABLE GLASS-CERAMIC AND POLYIMIDE MATERIALS THAT CAN BE PROCESSED WITH CONVENTIONAL PHOTOLITHOGRAPHY TECHNIQUES. THE SUPERIOR PROPERTIES OF THESE MATERIALS INCLUDE A CAPABILITY FOR PRECISION FABRICATION OF COMPLEX THREE-DIMENSIONAL STRUCTURES FOR PLANAR CHIP BONDING, DIRECT HEAT REMOVAL, WAFER STACKING FEEDTHROUGH VIAS AND MATCHED IMPEDANCE TRANSMISSION LINES. THE PHASE I EFFORT IS FOR A DEMONSTRATION OF THE NEW PACKAGING APPROACH BY FABRICATING AN IBM PC CLONE CPU/RAM ON A SINGLE ONE-INCH SQUARE SUBSTRATE WITH RECESSED CHIP CAVITIES. THE PHASE II EFFORT WILL INCLUDE DEMONSTRATIONS OF THERMAL AND WAFER STACKING VIAS AS WELL AS CONTROLLED IMPEDANCE LINES.

SPACE DATA CORP
1333 W 21ST ST
TEMPE, AZ 85282
CONTRACT NUMBER:
CLIFFORD P CHALFANT
TITLE:
LOW COST ALTERNATE LAUNCH SYSTEM FOR FLIGHT TESTING
TOPIC# 206 OFFICE: BMO/MYSC

SUBMITTED BY

A STUDY OF THE USE OF A MULTI-STAGE SOUNDING ROCKET AS A LOW COST ALTERNATE LAUNCH SYSTEM FOR FLIGHT TESTING OF SMALL REENTRY VEHICLES AT THE KWAJALEIN MISSILE RANGE (KMR) WILL BE PERFORMED. A COMBINATION OF GUIDED AND UNGUIDED STAGES IS CONTEMPLATED. A RELATIVELY LOW-COST, HIGH-PERFORMANCE SOLID MOTOR IS REQUIRED FOR THE FINAL VELOCITY STAGE. SELECTION OF A LAUNCH SITE IN THE NEAR VICINITY OF KMR IS ANTICIPATED. COST AND FEASIBILITY OF THE SYSTEM WILL BE DETERMINED AND A DEVELOPMENT AND TEST PLAN WILL BE PREPARED.

SPARTA INC
1055 WALL ST - STE 200
LA JOLLA, CA 92037
CONTRACT NUMBER: 87-C-0342
DR IRVING B OSOFSKY
TITLE:
PORTABLE HIGH EXPLOSIVES PRESSURE TRANSDUCER CALIBRATI
TOPIC# 11 OFFICE: AFATL/ASI

SPARTA, INC. PROPOSES A PROGRAM TO DESIGN, FABRICATE AND EVALUATE A PORTABLE PULSE GENERATING DEVICE THAT IS CAPABLE OF GENERATING PRESSURE PULSES UP TO 200 PSI WITH RISE TIMES OF LESS THAN 25 MICROSECONDS, WITH AN ACCURACY OF ONE PERCENT OR LESS. THE PRESSURE PULSE GENERATOR WILL BE PORTABLE AND SELF CONTAINED. REQUIRED ANCILLARY ELECTRICAL EQUIPMENT WOULD BE A BATTERY POWERED OSCILLOSCOPE, A STANDARD PIEZO-ELECTRIC PRESSURE TRANSDUCER AND ITS BATTERY POWERED SIGNAL CONDITIONER. THE PROPOSED PRESSURE PULSE GENERATOR IS A MINIATURE SHOCK TUBE WITH A HIGH PRESSURE HELIUM DRIVER THAT IS SUDDENLY RELEASED THROUGH A DIAPHRAGM AND EXPANSION NOZZLE INTO A SHOCK TUBE WHERE THE NORMAL PULSE DEVELOPS AND SWEEPS BY OR IMPINGES ON THE TEST TRANSDUCER. A STANDARD PIEZO-ELECTRIC TRANSDUCER IS USED TO CALIBRATE THE STRENGTH OF EACH PULSE. SHOCK OVER PRESSURE IS VARIABLE BY THE OPERATOR'S SETTING OF INITIAL DRIVER PRESSURE AT THE TEST TEMPERATURE.

SPARTA INC
16516 BERNARDO CENTER DR - STE 200-F
SAN DIEGO, CA 92128
CONTRACT NUMBER: F04701-87-C-0119
WILLIAM A GRENARD
TITLE:
DETERMINATION OF COUNTERMEASURES TO BISTATIC RADAR
TOPIC# 174 OFFICE: SD/SPO

SUBMITTED BY

A STUDY IS PROPOSED TO DETERMINE COUNTERMEASURE TO BISTATIC RADAR SYSTEMS. BISTATIC SYSTEMS OFFER POTENTIAL ADVANTAGES FOR SURVEILLANCE, ESPECIALLY AS AIRCRAFT AND MISSILES ARE DEVELOPED WITH REDUCED RADAR SIGNATURES. THESE ADVANTAGES ARE ENHANCED RADAR CROSS SECTION OVER A LIMITED RANGE OF BISTATIC ANGLES, REDUCTION OF PROPAGATION LOSSES, AND REDUCED VULNERABILITY TO JAMMING. COUNTERMEASURES WILL BE DETERMINED THAT WILL NEGATE THESE ADVANTAGES OR DEFEAT BISTATIC SYSTEMS. PASSIVE METHODS CONSIDERED WILL INCLUDE DENIAL OF ADVANTAGEOUS GEOMETRIES, RADAR ABSORPTION, BODY SHAPING, AND PHASING OF PRINCIPAL SCATTERERS. ACTIVE METHODS WILL INCLUDE JAMMING, REPEATERS (SPOOFING), AND CANCELLATION. EMPHASIS WILL BE PLACED ON HYBRID BISTATIC SYSTEMS (SPACEBORNE TRANSMITTERS, AIRBORNE RECEIVERS). COUNTER-COUNTERMEASURES WILL BE CONSIDERED. THE RESULTS WILL INCLUDE RECOMMENDED COUNTERMEASURES OR COMBINATIONS OF COUNTERMEASURES, AND DEFINITION OF NEEDED TESTS OR MEASUREMENTS TO DEMONSTRATE THE VALIDITY OF THE RECOMMENDATIONS.

SPARTA INC
23293 S POINTE DR
LAGUNA HILLS, CA 92653
CONTRACT NUMBER:
ROBER RISS
TITLE:
ADVANCED BASING SYSTEM CONCEPT DEFINITION ASSESSMENT
TOPIC# 204 OFFICE: BMO/MYSC

IN ORDER TO ASSESS PERFORMANCE CHARACTERISTICS AND CONCEPT DEFINITION OF VARIOUS LAND-BASING MODES FOR ICBMs THE SYSTEM EFFECTIVENESS, SURVIVABILITY, AND OPERATIONAL EFFECTIVENESS MUST BE DETERMINED. THIS PROJECT INVOLVES THE DEVELOPMENT OF AN INTERACTIVE COMPUTER PACKAGE (USING SOME EXISTING CODE) TO COMPUTE THESE MEASURES OF EFFECTIVENESS. THIS WILL INVOLVE THE DEVELOPMENT OF AN OPTIMAL ALLOCATION ALGORITHM FOR ASSIGNING SOVIET RVs TO US BASING MODES. TWO ISSUES OF PARTICULAR IMPORTANCE ARE 1) THE OPERATIONAL EFFECTIVENESS OF PEACEKEEPER AGAINST THINNED (POST-ATTACH) SOVIET ASSETS AND 2) THE RESPONSIVENESS OF MISSILES DEPLOYED IN THE DEEP BASE OPTION.

SPARTA INC
PO BOX 1354 - 1055 WALL ST/STE 200
LA JOLLA, CA 92038
CONTRACT NUMBER:
DR H M BERKOWITZ
TITLE:
OPTIMAL AIRFRAME (HEATSHIELD AND SUBSTRUCTURE) DESIGN
SMALLER BALLISTIC REENTRY VEHICLE
TOPIC# 210 OFFICE: BMO/MYSC

SUBMITTED BY

THIS PHASE I SBIR EFFORT'S OBJECTIVES (1) ARE TO DEVELOP ONE OR MORE PRELIMINARY DESIGN(S) FOR AN OPTIMAL AIRFRAME (HEATSHIELD AND SUBSTRUTURE) FOR A NEW, SMALLER BALLISTIC REENTRY VEHICLE (BRV) CARRYING A 50-200 KILOTON WARHEAT, FOR USE ON ICBMs, AND (2) PLAN THE PROGRAM AND PREPARE COST AND SCHEDULE ESTIMATES FOR THE PHASE II SBIR PROGRAM FOLLOW-ON DETAILED DESIGN AND DEVELOPMENT WORK. IT'S SCOPE INCLUDES ESTABLISHING LIMITING INTERNAL AND EXTERNAL ENVELOPES FOR BRV DESIGN; ESTABLISHING REENTRY REQUIREMENTS; SYNTHESIZING RV DESIGNS; DETERMINING AERODYNAMIC LOADS, AEROHEATING, AND THERMAL RESPONSE; SIZING SUBSTRUCTURES AND AIRFRAME; AND PLANNING THE PHASE II SBIR PROGRAM.

SPARTA INC
23293 S POINTE DR
LAGUNA HILLS, CA 92653
CONTRACT NUMBER:
CARL T CASE
TITLE:
TARGET DAMAGE ASSESSMENT BY BALLISTICALLY DELIVERED SE
TOPIC# 217 OFFICE: BMO/MYSC

THIS PROPOSAL PRESENTS AN INNOVATIVE APPROACH TO NUCLEAR DAMAGE ASSESSMENT. A SENSOR SYSTEM DELIVERED EITHER WITH AN RV OR IN THE SAME TIME AS AN RV OBSERVES DAMAGE SUSTAINED AS A RESULT OF NUCLEAR EXCHANGE. THE TOTAL DAMAGE ASSESSMENT SYSTEM IS DIVIDED INTO THE PRINCIPAL SUBSYSTEMS (DELIVERY, G&C, SENSOR, DATA PROCESSING, COMM/COMM RELAY) AND ALTERNATIVE APPROACHES ARE IDENTIFIED TO CONFIGURE EACH SUBSYSTEM. TRADE-OFFS WITHIN EACH SUBSYSTEM AND AMONG THE SUBSYSTEMS ARE IDENTIFIED. MULTIPLE SYSTEM CONFIGURATIONS MEETING SYSTEM PERFORMANCE REQUIREMENTS WILL BE DEVELOPED. THE DIFFERENT CONFIGURATIONS WILL BE EVALUATED AS TO PERCEIVED ADVANTAGES AND DISADVANTAGES, AND A BASELINE CONFIGURATION RECOMMENDED.

SPARTA INC
3440 CARSON ST - STE 300
TORRANCE, CA 90503
CONTRACT NUMBER:
DANIEL T NOWLAN
TITLE:
ANTI-SIMULATION DEVICES
TOPIC# 218 OFFICE: BMO/MYSC

SUBMITTED BY

CURRENT PENETRATION AID SYSTEMS FOR STRATEGIC BALLISTIC MISSILES RELY ON THE USE OF REPLICA OR SIMULATION DECOYS TO CONFUSE THE ENEMY. SIMULATION OF THE OBSERVABLE CHARACTERISTICS OF THE LARGE REENTRY VEHICLES WITH SMALL REPLICA DECOYS IS A DIFFICULT TECHNOLOGY. ANTI-SIMULATION IS A TACTIC WHEREBY THE STATISTICAL DISTRIBUTION OF THE REENTRY VEHICLES IS BROADENED, THUS RELAXING THE SIMULATION REQUIREMENTS FOR REPLICA DECOYS. SPARTA PROPOSES TO DEVELOP APPROACHES AND TECHNIQUES TO ANTI-SIMULATION THAT HAVE A MINIMUM IMPACT ON THE PERFORMANCE OF THE EXISTING STRATEGIC MISSILE FORCE. WE PROPOSE TO CORRELATE THE VARIABILITY IN CURRENT MANUFACTURING PROCESSES WITH THE STATISTICAL DISTRIBUTION OF VARIOUS RADAR AND OPTICAL OBSERVABLES AND THE TARGETING ACCURACY AND SURVIVABILITY. THIS CORRELATION WILL THEN BE USED TO ASSESS THE PAYOFF IN RELAXING MANUFACTURING QUALITY CONTROL PROCEDURES AND/OR IN RECOMMENDING SLIGHT MODIFICATIONS TO THE REENTRY VEHICLE AND DECOY DESIGN.

SPARTA INC
23293 S POINTE DR
LAGUNA HILLS, CA 92653
CONTRACT NUMBER:
RUDRAPATNA V RAMNATH
TITLE:
VARIABLE STABILITY CONTROL ANALYSIS AND DESIGN FOR ICB
TOPIC# 236 OFFICE: BMO/MYSC

A GENERAL METHODOLOGY IS PROPOSED FOR THE ANALYSIS AND SYNTHESIS OF ADVANCED CONTROL SYSTEMS FOR ICBM. THE EFFECT OF VARIABLE FLIGHT CONDITIONS ON THE STABILITY AND RESPONSE OF SUCH FLIGHT VEHICLES IS DISCUSSED. IN PARTICULAR, POSSIBILITIES OF COUNTERINTUITIVE BEHAVIOR SOMETIMES EXHIBITED BY SUCH SYSTEMS AND THE INADEQUACY AND MISREPRESENTATIONS OF USING SIMPLISTIC MODELS ARE DISCUSSED. IN CONTRAST TO THE USUAL PRACTICE OF USING BANDS OF FIXED GAINS IN THE CONTROL SYS TEMS, THE USE OF VARIABLE GAIN SCHEDULING IS ADDRESED IN ORDER TO IMPROVE SYSTEM PERFORMANCE. TO SOLVE THESE PROBLEMS, A SYSTEMATIC APPROACH TO THE ANALYSIS AND DESIGN OF NON-AUTONOMOUS CONTROL SYSTEMS FOR THESE VEHICLES WILL BE DEVELOPED. THE APPROACH TO BE USED IS THE GENERALIZED MULTIPLE SCALES (GMS) METHOD ESTABLISHED BY THE PRINCIPAL INVESTIGATOR. THIS METHOD IS IDEALLY SUITED TO THESE PROBLEMS AS IT IS PARTICULARLY APPLICABLE TO THE STUDY OF NON-AUTONOMOUS PHENO-

SUBMITTED BY

MENA EXHIBITING RAPID AND SLOW DYNAMICS AS IN THE CASE OF THE HYPER-VELOCITY MISSILE. THE GMS APPROACH IS ESPECIALLY APPLICABLE TO THE DESIGN OF SUCH CONTROL SYSTEMS. THE PHASE I EFFORT WILL DEVELOP THE METHODOLOGY AND VALIDATE IT TO A FIRST LEVEL USING AVAILABLE ICBM DATA. THE PHASE II TASK WILL EXTEND AND REFINE THE TECHNIQUE TO TREAT MORE COMPLEX CHARACTERIZATIONS OF THE VEHICLE AND INCLUDE EXTENSIVE VALIDATION SIMULATIONS.

SPECTRUM 39 (S I DIV)
3811 CANTERBURY RD
BALTIMORE, MD 21218
CONTRACT NUMBER: F19628-87-C-
DR WILLIAM J SCHUMAN
TITLE:
ADVANCED DESIGN CONCEPTS FOR ELECTRONIC EQUIPMENT SHEL
TOPIC# 29 OFFICE: ESD/XR

THE OBJECTIVE OF THIS PROJECT IS TO DEVELOP DESIGN CONCEPTS FOR AIR FORCE ELECTRONIC EQUIPMENT SHELTERS USING ADVANCED MATERIALS. THE PROJECT EFFORT WILL CONSIST OF FOUR TASKS: 1) DETERMINATION OF DESIGN CRITERIA, 2) SURVEY OF ADVANCED MATERIALS AND FABRICATION TECHNIQUES, 3) DEVELOPMENT OF DESIGN CONCEPTS AND 4 FINAL REPORT. IN TASK 1 THE DESIGN CRITERIA FOR ELECTRONIC EQUIPMENT SHELTERS WILL BE DETERMINED. INCLUDED ARE FOUR AREAS: 1) CONFIGURATION (SIZE, SHAPE, WEIGHT, OPENING, ETC.), 2) COSTS (MATERIAL, FABRICATION, LIFECYCLE), 3) ENVIRONMENTAL (HEAT, RAIN, MOBILITY, DROPS, ETC.), AND 4) THREATS (CONVENTIONAL WARFARE AND NUCLEAR WARFARE). IN TASK 2 THE LATEST ADVANCES IN MATERIALS, ADHESIVES, SEALANTS AND BONDING TECHNIQUES WILL BE REVIEWED. IN TASK 3 THE RESULTS OF TASKS 1 AND 2 WILL BE INTEGRATED INTO DESIGN CONCEPTS: MINIMUN COST OR WEIGHT FOR ENVIRONMENT ONLY OR WITH THREATS INCLUDED FOR SEVERAL CONFIGURATIONS. EXTENSIVE EXPERIENCE IN DESIGNING A FAMILY OF ELECTRONIC EQUIPMENT SHELTERS FOR THE US ARMY HAS LED TO INTERNATIONAL RECOGNITION OF S I PERSONNEL AND WILL INSURE INNOVATIVE DESIGN CONCEPTS. IN TASK 4 A FINAL REPORT WILL BE PREPARED.

SPIRE CORP
PATRIOTS PK
BEDFORD, MA 01730
CONTRACT NUMBER: F33615-87-C-2787
STEPHEN P TOBIN
TITLE:
HIGHLY TEMPERATURE-STABLE LOW SHADOW LOSS METALLIZATIO
SUPERIOR SPACE SOLAR CELLS
TOPIC# 124 OFFICE: AFWAL/PO

SUBMITTED BY

THE PROPOSED THREE-PHASE PROGRAM INVESTIGATES THE INTEGRATION OF A VERY STABLE METALLIZATION SYSTEM WITH A METAL FORMATION PROCESS YIELDING HIGHLY EFFICIENT LOW-LOSS CONFIGURATION. THE LOW-LOSS METALLIZATION COMPRISES HIGH-ASPECT-RATIO GRID LINES WHICH CAN BE MADE TALL TO LIMIT GRID SERIES RESISTANCE WITHOUT INCREASING SHADOW LOSS. HIGH TEMPERATURE STABILITY IS OBTAINED BY EMPLOYING TiN DIFFUSION BARRIERS. IN PHASE I WE PROPOSE TO INVESTIGATE THE FEASIBILITY OF COMBINING THESE TECHNIQUES WITH A HIGH-EFFICIENCY CELL DESIGN TO OBTAIN A SUPERIOR GaAs SPACE SOLAR CELL. COMPATIBILITY WITH PRESENT DAY PRODUCTION PROCESSES IS ADDRESSED. IN PHASE II, RESEARCH LEADING TO PROTOTYPE CELLS WILL BE CARRIED OUT. IN PHASE III THE RESULTANT KNOW-HOW WILL BE COMMERCIALIZED.

SRS TECHNOLOGIES
990 EXPLORER BLVD NW
HUNTSVILLE, AL 35806
CONTRACT NUMBER:
JEFFREY S YALOWITZ
TITLE:
INTEGRATED EXPERT SYSTEM FOR SENTIENT RADIO RECEIVERS
TOPIC# 49 OFFICE: RADC/XPX

THE OBJECTIVE OF THIS RESEARCH IS TO INVESTIGATE MEANS OF IMPROVING RADIO RECEPTION AND THE QUALITY OF DEMODULATED INFORMATION BY INCORPORATING WARENESS OF THE ELECTRO-MAGNETIC ENVIRONMENT IN COMMUNICATIONS RECEIVERS. EMPHASIS IS PLACED ON THE INTEGRATED USE OF EXPERT SYSTEMS AND ADAPTIVE SIGNAL PROCESSING TECHNIQUES. ADAPTIVE TECHNIQUES PERMIT RECEIVER SUBSYSTEMS TO SENSE THE RECEIVED SIGNAL AND THEN ADJUST THEIR EFFECTS ON THE SIGNAL TO ENHANCE RECEPTION QUALITY. AN EXPERT SYSTEM IS ABLE TO MONITOR ALL SUB-SYSTEMS SIMULTANEOUSLY, THEN USE HEURISTICS, RULES, AND AN EXTENSIVE DATA BASE TO OPTIMIZE RECEPTION QUALITY BEYOND THE CAPABILITIES OF CURRENT TECHNIQUES. THIS RESEARCH FOCUSES ON DETERMINING THE CAPABILITY OF SYMBOLIC AND HEURISTIC PROCESSING METHODS IN AN EXPERT SYSTEM WITH ADAPTIVE SIGNAL PROCESSING TECHNIQUES AND THE ASSOCIATED UNDERLYING PRINCIPLES OF INFORMATION THEORY, ESTIMATION THEORY, DECISION THEORY, AND MODERN CONTROL THEORY. EXPERT SYSTEM AND KNOWLEDGE BASE ARCHITECTURES CAN EFFECTIVELY REPRESENT AND USE THE SELECTED ADAPTIVE SIGNAL PROCESSING TECHNIQUES TO INCORPORATE HUMAN HEURISITC JUDGEMENTAL QUALITIES INTO

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THE RECEIVER. ADDITIONALLY, THE SOFTWARE DEVELOPMENT ENVIRONMENT USED TO PRODUCE THE EXPERT SYSTEM MUST FACILITATE DEVELOPMENT, MAINTENANCE, TESTING, AND VALIDATION OF THE RESULTING SOFTWARE. TACTICAL SYSTEM IMPLEMENTATIONS REQUIRE REAL-TIME OPERATION OF THE EXPERT SYSTEM MICROPROCESSOR HARDWARE THAT IS RUGGED AND COMPACT.

SRS TECHNOLOGIES
990 EXPLORER BLVD NW
HUNTSVILLE, AL 35806
CONTRACT NUMBER: F33615-87-C-1468
JEFFREY S YALOWITZ
TITLE:
EXPERT COMMUNICATIONS RESOURCE MANAGER
TOPIC# 156 OFFICE: AFWAL/AA

THE OBJECTIVE OF THIS RESEARCH IS TO INVESTIGATE NEW AUTOMATED METHODS OF SENSING, PLANNING, AND CONTROLLING THE USE OF RADIO FREQUENCY COMMUNICATIONS PARAMETERS OF SOPHISTICATED MILITARY AIRCRAT AT THE AIRCRAFT PLATFORM AND DATA LINK LEVELS, TO MAXIMIZE THE OVERALL QUALITY AND RELIABILITY OF THE INFORMATION TRANSMITTED AND RECEIVED. EMPHASIS IS PLACED ON METHODOLOGIES AND MEASUREMENT CRITERIA FOR REAL-TIME EVALUATION OF RF CHANNEL PERFORMANCE, SPECTRUM UTILIZATION, ELECTROMAGNETIC INTERFERENCE ENVIRONMENT, AND EQUIPMENT CONFIGURATION, AND FOR ADAPTIVE CONTROL OF THESE FUNCTIONS UNDER PHYSICAL CONDITIONS AND USER DEMANDS THAT VARY WITH TIME. THE INNOVATIVE AUTOMATED COMMUNICATIONS RESOURCE MANAGEMENT STRUCTURE PROPOSED FOR THIS PURPOSE EMPLOYS AN EXPERT SYSTEM ARCHITECTURE AND CUSTOMIZED KNOWLEDGE BASES, ONE WHICH HOUSES A PRIORI INFORMATION ABOUT ON-BOARD AVIONICS AND PROPAGATION CHARACTERISTICS AND ANOTHER WHICH STORES DATA ACQUIRED FROM ON-LINE SENSING OF THE AIRCRAFT STATUS AND ENVIRONMENT. SIMPLIFIED CHANNEL AND EMITTER SPECTRAL MODELS ARE CONSTRUCTED FROM GENERALIZED TEMPLATES, AND HEURISTIC PROCEDURES ARE DEVELOPED TO APPROXIMATE OPTIMUM CONTROL SOLUTIONS.

SSG INC
150 BEAR HILL RD
WALTHAM, MA 02154
CONTRACT NUMBER:
HAROLD A GRAHAM
TITLE:
CRYOGENIC RADIATION MONITORING MICROSCOPE
TOPIC# 21 OFFICE: AEDC/DOT

SUBMITTED BY

THE PROPOSED DEVICE IS AN INFRARED CRYOGENIC MICROSCOPE FOR MEASURING THE RADIOMETRIC OUTPUT OF SELECTIVELY HEATED PIXELS OF IR SCENE GENERATORS. THE MICROSCOPE COVERS THE WAVELENGTH REGION FROM 1 TO 125 MICRONS CAN RESOLVE 0.0001" INCREMENTS ON THE MOSAIC SURFACE. THE MICROSCOPE HAS SUFFICIENT DYNAMIC RANGE TO MEASURE TEMPERATURES FROM APPROXIMATELY 40K TO 1500K. INTERCHANGEABLE OBJECTIVE ELEMENTS ALLOW VARIABLE MAGNIFICATION FROM 1 x TO 40 x IN DISCRETE STEPS. REMOTELY CONTROLLED FILTERS PROVIDE ROUGH SPECTRAL MEASUREMENTS WHILE A REMOTELY CONTROLLED PINHOLE APERTURE PROVIDES VARIABLE SPATIAL RESOLUTION. THE DEVICE CAN EVALUATE EITHER PULSED OR CONTINUOUSLY HEATED PIXELS AND CAN ACCURATELY SCAN A LARGE AREA MOSIAC (TO 8" X 8").

STRAINOPTIC TECHNOLOGIES INC
108 W MONTGOMERY AVE
NORTH WALES, PA 19454
CONTRACT NUMBER: F33615-87-C-3233
ALEX S REDNER
TITLE:
DIGITAL IMAGE ANALYSIS SYSTEM FOR MONITORING CRACK-GRO
ELEVATED TEMPERATURE
TOPIC# 110 OFFICE: AFWAL/FI

THE OBJECTIVE OF THE PROPOSED RESEARCH IS TO DEVELOP A NEW APPROACH TO THE PROBLEM OF LOCATING THE TIP OF A CRACK AND MEASURING ITS GROWTH. THE PROPOSED SYSTEM SHOULD BE CAPABLE OF PERFORMING THIS TASK AUTOMATICALLY, AT ROOM OR AT ELEVATED TEMPERATURE, WHILE THE SPECIMEN IS SUBJECTED TO FATIGUE CYCLING IN AN OVEN. THE PROPOSED SYSTEM WILL CONSIST OF A PROBE, IMAGING THE CRACK TIP ON A FIBER-OPTIC IMAGE GUIDE, CARRYING AN ENLARGED IMAGE OF THE CRACK TIP TO A DIGITAL IMAGE ANALYSIS SYSTEM. A MICROCOMPUTER PROGRAM WILL BE PREPARED TO LOCATE THE CRACK-TIP POSITION AND DIRECT THE SERVO-POSITIONER TO RELOCATE THE HEAD OF THE PROBE THAT IS OBSERVING THE CRACK TIP. THE MAXIMUM OPERATING TEMPERATURE WILL BE LIMITED ONLY BY THE CAPABILITY AND LIMITATION OF THE OPTICAL SYSTEM AND THE FIBER-OPTIC IMAGE GUIDE SELECTED.

SUMMIT ANALYTICAL SCIENCES INC
1867 AUSTIN BLUFFS PKWY - #202
COLORADO SPRINGS, CO 80907
CONTRACT NUMBER:
MARIJKE F AUGUSTEIJN
TITLE:
AN INTELLIGENT SYSTEM PROTOTYPE FOR AIR FORCE TRAINING
TOPIC# 83 OFFICE: AMD/RDO

SUBMITTED BY

WE PROPOSE TO BUILD A DOMAIN-INDEPENDENT INTELLIGENT TRAINING SYSTEM PROTOTYPE SUITABLE FOR AIR FORCE TRAINING NEEDS. THE PROTOTYPE WILL BE DEMONSTRATED IN A FIELD OF TRAINING TO BE DETERMINED. A HUMAN-COMPUTER INTERFACE WILL HAVE NATURAL LANGUAGE PROCESSING CAPABILITY IN THE SELECTED DOMAIN. THE ITS WILL ADAPT INSTRUCTIONS ACCORDING TO A TRAINEE'S LEARNING STYLE AND PREFERENCES. IT WILL BE CAPABLE TO COACH A TRAINEE WORKING ON EXERCISES AND DO LIMITED MISCONCEPTION ANALYSIS.

SUSQUEHANNA RESOURCES & ENVIRONMENT INC
305 MAIN ST - STE 104
JOHNSON CITY, NY 13790
CONTRACT NUMBER:
TIMOTHY D MASTERS
TITLE:
GROUND MOBILE TARGET DISCRIMINATION TECHNIQUES WITH CO
OF NON-IMAGE AND IMAGE BASED DATA
TOPIC# 217 OFFICE: BMO/MYSC

FOR THIS SBIR EFFORT, WE WILL FUSE NON-IMAGE AND IMAGE-BASED DATA FOR EXTRACTING MOBILE-MISSILE TARGETS FROM THE BACKGROUND CLUTTER. THE PROVEN MOBILE TARGET ANALYSIS TECHNOLOGY DEVELOPED BY PLANNING RESEARCH CORPORATION USING NON-IMAGE BASED DATA WILL BE USED AS AN INITIAL APPROACH TO NARROW DOWN THE POTENTIAL TARGET SITES. THE NEXT ACTION IS TO EMPLOY LOW RESOLUTION MULTISPECTRAL IMAGERY TO REJECT THE BACKGROUND AREAS THAT HAVE A LOW PROBABILITY OF TARGET LOCATION. FOR FEATURE EXTRACTION AND CAMOUFLAGE DETECTION PROCESSED, HIGH RESOLUTION IMAGE DATA LIKE SAR, ELECTRO-OPTICAL, THERMAL IR AND EVEN VIDEO IMAGERY WILL BE EXPLOITED. PRECISION TARGETING FOR A BALLISTIC MISSILE DELIVERY SYSTEM WILL BE ACCOMPLISHED BY A SCENE MATCHING METHODOLOGY USING THE STABLE STRUCTURE AREA AROUND THE TARGET LOCATION. WITH MULTI-TEMPORAL IMAGE DATA, MOBILE MISSILES CAN BE DETECTED BY MEANS OF A STRUCTURAL CHANGE DETECTION METHODOLOGY; THIS NOVEL APPROACH IS TO PERFORM THE CANCELLATION OF THE STATIONARY OBJECTS BY MEANS OF SUBTRACTING THE SCENE'S STRUCTURAL UNITS INSTEAD OF THE PIXELS. THE BASIS FOR THE PROPOSED IMAGE EXPLOITATION TECHNOLOGIES IS THE STABLE STRUCTURE THEORY AND ITS ASSOCIATED ALGORITHMS DEVELOPED BY DR. HSU OF SR&E. SINCE THE MAJORITY OF THE PROPOSED ALGORITHMS HAVE BEEN EVALUATED AND DETERMINED AS VERY EFFECTIVE

SUBMITTED BY

FOR EXTRACTING GROUND TARGETS FROM THE BACKGROUND CLUTTER, WE FIRMLY BELIEVE THAT THE PROPOSED METHODOLOGIES WILL WORK FOR THE MOBILE-MISSILE TARGETS AS WELL.

SYNERGISTIC DETECTOR DESIGNS
2438 WYANDOTTE ST - BLDGE A
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER: F33615-87-C-5283
B KINCHEN
TITLE:
LARGE FIELD OF VIEW REAL-TIME X-RAY IMAGING SYSTEM
TOPIC# 94 OFFICE: AFWAL/ML

REAL-TIME DIGITAL X-RAY IMAGING SYSTEMS ARE CURRENTLY BEING USED TO INSPECT ROCKET MOTORS SUCH AS THE C4, HAWK, STANDARD MISSILE, AND SIDEWINDER AS WELL AS NUMEROUS AERO-TURBINE PARTS. IN MOST CASES THE SIZE OF THE FIELD OF VIEW (FOV) IS LIMITED BY THE DIGITAL PROCESSOR REQUIREMENT TO BREAK THE IMAGE INTO 512 X 512 PIXELS. RECENTLY PROCESSORS HAVE BECOME AVAILABLE THAT PROVIDE DIGITAL IMAGES WITH 1024 X 1024 PIXELS, WHICH WOULD ALLOW A FIELD OF VIEW INCREASE OF UP TO A FACTOR OF FOUR, THUS SIGNIFICANTLY REDUCING THE INSPECTION TIME. HOWEVER, THERE ARE A NUMBER OF PARAMETERS ASSOCIATED WITH THE INSPECTION OF ROCKET MOTORS, SUCH AS THE PULSED X-RAY SOURCE, REDUCTION OF LENS TRANFER EFFICIENCY WITH INCREASED FOV, OPERATION OF THE VIDEO CAMERA AT THE SLOWER SCAN RATES WHILE EXPOSED TO THE PULSED X-RAY SOURCE, ETC., THAT MIGHT PROHIBIT A SYSTEM BASED UPON THE AVAILABLE 1024 X 1024 DIGITAL PROCESSORS AND CAMERAS FROM ACHIEVING REQUIRED RADIOGRAPHIC SENSITIVITY. THE OBJECTIVE OF THIS PROGRAM IS TO OPTIMIZE AND DEMONSTRATE A 1024 X 1024 DIGITAL X-RAY INSPECTION SYSTEM WITH A 15 IN.X15 IN. FOV SPECIFICALLY FOR INSPECTION OF A 14 IN. DIAMETER ROCKET MOTOR SUCH AS THE HAWK OR STANDARD MISSILE.

SYNETICS CORP
80 MAIN ST
READING, MA 01867
CONTRACT NUMBER:
ALAN E GOULD
TITLE:
AIDA - A SYSTEM COMBINING AI AND ADA TO SUPPORT RAPID AND THE RE-USE OF GENETIC SOFTWARE PACKAGES
TOPIC# 61 OFFICE: RADC/XPX

SUBMITTED BY

AS SOFTWARE GROWS IN COMPLEXITY AND COST, VALIDATING SOFTWARE DESIGN BEFORE ACTUAL DEVELOPMENT BECOMES VITAL. THE MOST EFFECTIVE WAY TO DO THIS IS A SYSTEM THAT AUTOMATICALLY GENERATES PROTOTYPE SOFTWARE DIRECTLY FROM SPECIFICATIONS. EFFECTIVELY CONTROLLING THE GROWING COMPLEXITY AND COST OF SOFTWARE ALSO REQUIRES VIEWING SOFTWARE COMPONENTS AS "PARTS." ALTHOUGH GENERIC SOFTWARE PACKAGES USING THE ADA PROGRAMMING LANGUAGE ARE BEING DEVELOPED, AN AUTOMATED SELECTION AND CONFIGURATION MANAGEMENT TOOL IS VITAL TO THEIR EFFECTIVE USE. AIDA IS A SOFTWARE SYSTEM WHICH USES THE TECHNIQUES OF ARTIFICIAL INTELLIGENCE (AI) AND THE FEATURES OF ADA TO ADDRESS THE ISSUES OF RAPID PROTOTYPING AND COMPONENT REUSABILITY. IT IS DESIGNED TO CONTROL THE COMPLEXITY AND COST OF SOFTWARE BY SUPPORTING RAPID PROTOTYPING AND THE RE-USE OF GENERIC SOFTWARE PACKAGES.

SYSTEMS & SECURITY TECHNOLOGY CORP
1 HORSESHOE CIR
FREDERICKBURG, VA 22405
CONTRACT NUMBER:
GARY W KINCAID
TITLE:
TEXT UNDERSTANDING
TOPIC# 60 OFFICE: RADC/XPX

THIS RESEARCH AND DEVELOPMENT INVOLVES RESEARCH INTO THE IMPLEMENTATION OF MESSAGE DISSEMINATION TECHNIQUES THAT CAN IMPROVE THE PRECISION AND RECALL OF EXISTING AND NEAR-TERM AUTOMATED MESSAGE HANDLING SYSTEMS. SPECIFICALLY SEVERAL TECHNIQUES FOR TEXT UNDERSTANDING WILL BE INVESTIGATED. THESE INCLUDE INFLECTIONAL MORPHOLOGICAL ANALYSIS, DERIVATIONAL MORPHOLOGICAL ANALYSIS, AND SEMANTIC PROCESSING. IN ADDITION REPRESENTATION ISSUES WILL BE RESEARCHED AS WELL AS REQUISITE MAN-MACHINE INTERFACE FUNCTIONALITY.

SYSTRAN CORP
4126 LINDEN AVE
DAYTON, OH 45432
CONTRACT NUMBER: F33615-87-C-5288
MILTON E ZELLMER
TITLE:
ENVIRONMENT INFLUENCE ON THE DUCTILITY AND CRACK GROWT
OF GAMMA PRIME NICKEL ALUMINIDE (Ni3Al)
TOPIC# 104 OFFICE: AFWAL/ML

SUBMITTED BY

ORDERED INTERMETALLIC NICKEL ALUMINIDE Ni3Al MICROALLOYED WITH BORON POSSESSES ATTRACTIVE MECHANICAL PROPERTIES FOR STRUCTURAL USE AT ELEVATED TEMPERATURES. FOR ITS POTENTIAL APPLICATION IN THE AIRCRAFT GAS TURBINE ENGINE COMPONENTS, BETTER UNDERSTANDING OF THE STRUCTURE-PROPERTY RELATIONSHIPS, ENVIRONMENTAL INFLUENCE AT ELEVATED TEMPERATURES AND LIFE LIMITING PROCESSES FOR THE MATERIAL IS REQUIRED. PHASE I RESEARCH INVOLVES INVESTIGATION OF ENVIRONMENTAL INFLUENCE ON THE DUCTILITY AND FATIGUE CRACK GROWTH BEHAVIOR OF Ni3Al BY CONDUCTING TESTS IN LABORATORY AIR AND ULTRA HIGH VACUUM ENVIRONMENTS, WITH TEMPERATURES RANGING FROM ROOM TEMPERATURE TO 600 DEG C. TENSILE AS WELL AS CONSTANT LOAD AMPLITUDE FATIGUE CRACK GROWTH TESTS WILL BE CONDUCTED USING A SERVOHYDRAULIC TESTING MACHINE UNDER COMPUTER CONTROL. DETAILED FRACTOGRAPHIC ANALYSIS OF ALL FRACTURE SURFACES USING A SCANNING ELECTRON MICROSCOPE IS ALSO PLANNED. RELATIONSHIPS BETWEEN THE MICROSTRUCTURE AND FRACTURE MORPHOLOGY WILL BE EVALUATED. A COMPARISON BETWEEN THE AIR AND VACUUM TEST DATA WILL BE MADE TO UNDERSTAND THE ENVIRONMENTAL IMPACT. RESULTS OF PHASE I PRELIMINARY DATA WILL BE USED TO SELECT AN OPTIMUM ALLOY DESIGN AND DERIVE A WORK PLAN FOR PHASE II RESEARCH.

SYSTRAN CORP
4126 LINDEN AVE
DAYTON, OH 45432
CONTRACT NUMBER: F33615-87-C-5302
MILTON E ZELLMER
TITLE:
INTEGRATED INFORMATION SUPPORT SYSTEM IMPLEMENTATION
TOPIC# 107 OFFICE: AFWAL/ML

DEVELOPMENT EFFORTS IN THE AREA OF COMPUTERIZED SUPPORT TO MANAGEMENT AND MANUFACTURING OPERATIONS HAVE RESULTED IN COLLECTIONS OF HETEROGENEOUS SYSTEMS AND VIRTUALLY INCOMPATIBLE DATABASES WHICH DO NOT ALLOW THE INTEGRATION OF RELATED PROCESSES. THE NEED EXISTS TO DEMONSTRATE STATE-OF-THE-ART TOOLS WHICH ALLOW INTEGRATION AND COMMUNICATION WITHOUT COSTLY CHANGES TO EXISTING HARDWARE AND SOFTWARE. THE RESULTING ENVIRONMENT SHOULD BE ONE THAT IS CONDUCIVE TO FUTURE CHANGE AND CONTINUED INTEGRATION. AT THIS TIME, IIS AND MAP/TOP HAVE EMERGED AS THE LEADING EDGE OF GOVERNMENT AND INDUSTRY EFFORTS TO EVOLVE A STANDARDIZED, GENERIC SYSTEM FOR AN INTEGRATED, MULTI-VENDOR

SUBMITTED BY

ENVIRONMENT. SYSTRAN PROPOSES TO INSTALL AND IMPLEMENT AN IISS-MAP/TOP INTEGRATED ENVIRONMENT AT THE AFWAL MATERIALS LABORATORY (AFWAL/ML). PHASE I WORK WILL CONSIST OF AN ASSESSMENT OF EXISTING AFWAL/ML HARDWARE AS WELL AS A DETERMINATION OF THE SUPPORT REQUIREMENTS FOR THESE INTEGRATION TOOLS. PHASE I EFFORTS WILL RESULT IN A PROPOSAL FOR PHASE II DEMONSTRATIONS OF BOTH THE INTEGRATED SYSTEMS AND SYSTRAN'S MANUFACTURING-MANAGEMENT WORKSTATION. DEVELOPMENT EFFORTS FOR THIS WORKSTATION WILL CENTER ON SEMANTIC GENERATION OF AN INTEGRATED DATABASE AND USER APPLICATIONS WHICH USE THE TECHNOLOGIES AVAILABLE IN THESE STATE-OF-THE-ART TOOLS.

TACAN CORP
2111 PALOMAR AIRPORT RD - STE 270
CARLSBAD, CA 92008
CONTRACT NUMBER:
DR MICHAEL M SALOUR
TITLE:
OPTICAL SWITCHING USING NONLINEAR OPTICAL PROPERTIES O
ORGANIC MATERIALS
TOPIC# 47 OFFICE: RADC/XPX

AS A GROWING CLASS OF NOVEL ELECTRONIC MATERIALS, CONDUCTING POLYMERS MUST BE EVALUATED AS FAST RESPONSE NONLINEAR OPTICAL MATERIALS. WE PROPOSE TO CARRY OUT A SERIES OF STUDIES WITH THREE FOCAL POINTS DESIGNED TO UTILIZE NONLINEAR SEMICONDUCTING POLYMERS. THIS WOULD INCLUDE: (a) A DETAILED SYSTEMATIC STUDY OF NONLINEAR MEASUREMENTS (THIRD HARMONIC GENERATION, 3- AND 4-WAVE MIXING, DC FIELD-INDUCED SECOND HARMONIC GENERATION, ETC) TO CHARACTERIZE AND EVALUATE THESE POLYMERS AS NONLINEAR OPTICAL MATERIALS; (b) A SERIES OF STUDIES INVOLVING OPTICAL SWITCHING AND LOGIC DEVICES BASED ON PICOSECOND COUPLING OF HIGH-SPEED SIGNALS TO AND FROM THE THE NONLINEAR CONDUCTING POLYMERS STUDIED IN (a) AND A DETAILED ANALYSIS OF THE FABRICATION OF OPTICAL QUALITY THIN-FILM AND CHANNEL WAVEGUIDES; AND (c) A PROGRAM OF MATERIALS DEVELOPMENT DESIGNED TO PRODUCE OPTICAL QUALITY UNIFORM ORIENTED FILMS OF THESE SEMICONDUCTOR POLYMERS AND ANISOTROPIC (LINEAR AND NONLINEAR) OPTICAL PROPERTIES, IN ORDER TO EXTEND THE TECHNOLOGY DEVELOPED IN (b) TO THE DEVELOPMENT OF WAVEGUIDE MODULATION AND SWITCHING DEVICES, AND EXPLORATION OF SUCH CONCEPTS FOR NOVEL DESIGNS OF ULTRAHIGH-SPEED OPTICAL SWITCHING, SIGNAL PRO-

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CESSING, AND LOGIC OPERATION IN COMPACT POLYMERIC DEVICES.

TACAN CORP
2111 PALOMAR AIRPORT RD - STE 270
CARLSBAD, CA 92008
CONTRACT NUMBER: F33615-87-C-2784
DR MICHAEL M SALOUR
TITLE:
FIBER OPTIC TEMPERATURE SENSOR FOR TURBINE ENGINE APPL
TOPIC# 138 OFFICE: AFWAL/PO

WE PROPOSE TO INVESTIGATE OPTICAL FIBER SENSORS FOR THE DETERMINATION OF TEMPERATURE. WE EXPECT OUR NEW DESIGN TO HAVE A TEMPERATURE RANGE FROM BELOW ROOM TEMPERATURE TO NEARLY 2000 DEG C. THE CONFIGURATION USED HERE WILL BE APPLICABLE TO THE TESTING OF TEMPERATURES IN TURBINE ENVIRONMENTS. THE VERY SMALL SIZE OF THE FIBER-OPTIC PROBE WILL MINIMIZE PERTURBATIONS OF THE GAS FLOW IN THE TURBINE.

TARTAN LABS INC
461 MELWOOD AVE
PITTSBURGH, PA 15213
CONTRACT NUMBER: F33615-87-C-1466
LELAND SZEWERENKO
TITLE:
ADA FOR EMBEDDED SYSTEMS
TOPIC# 151 OFFICE: AFWAL/AA

EMBEDDED MISSION-CRITICAL SOFTWARE IS EXTREMELY SENSITIVE TO RUNTIME PERFORMANCE. THE ADA LANGUAGE IS RESPONSIVE TO THE SOFTWARE ENGINEERING PROBLEMS OF MISSION CRITICAL COMPUTING RESOURCE (MCCR) SYSTEMS. BUT ADA RUNTIME PACKAGES INFLUENCE AND OFTEN DETERMINE PERFORMANCE, RELIABILITY, FLEXIBILITY, AND RECONFIGURABILITY OF AN EMBEDDED APPLICATION. THIS RESEARCH WILL DEFINE A RUNTIME WHICH SUPPORTS EMBEDDED APPLICATIONS THAT CAN BE RUN ON A CONFIGURATION INCLUDING EITHER SINGLE OR MULTIPLE PROCESSORS AS WELL AS SHARED AND/OR DISTRIBUTED MEMORIES. THE RUNTIME IMPLEMENTATION WILL BE CONFIGURABLE SO THAT MINIMUM CODE SPACE IS OCCUPIED BY THE RUNTIME. FUNCTIONALLY, IT WILL PROVIDE FULL ADA SUPPORT WITH THE ADDITIONS OF MESSAGE COMMUNI-

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CATION AND RECONFIGURATION OF BOTH ADA APPLICATIONS AND PHYSICAL RESOURCES. IN THE RUNTIME IMPLEMENTATIONS, TARGET MACHINE-DEPENDENT CODE IS MINIMIZED AND SEGREGATED FROM THE BULK OF THE RUNTIME WHICH IS SHARED ADA CODE. PHASE II WILL COMPLETE THE DESIGN, SPECIFICATIONS AND DOCUMENTED IMPLEMENTATIONS OF THE RUNTIME FOR SEVERAL MACHINES, PROBABLY THE MIL-STD-1750A AND THE MOTOROLA 68020, AND FOR A MULTIPLE-PROCESSOR CONFIGURATION OF AT LEAST ONE MACHINE.

TARTAN LABS INC
461 MELWOOD AVE
PITTSBURGH, PA 15213
CONTRACT NUMBER: F33615-87-C-1474
DR ROBERT J CHANSLER JR
TITLE:
INTELLIGENT ADA COMPILER
TOPIC# 153 OFFICE: AFWAL/AA

MISSION-CRITICAL SOFTWARE DEPENDS ON PROGRAM EXECUTION SPEED AND COMPACT CODE SIZE. COMPILERS FOR THE HIGH-LEVEL LANGUAGE USED TO PROGRAM THESE APPLICATIONS MUST PRODUCE EXCELLENT TRANSLATIONS TO ACHIEVE THE NECESSARY EXECUTION PERFORMANCE AND TO CONSERVE STORAGE RESOURCES. THE ADA LANGUAGE WAS DEVELOPED BY THE DEPARTMENT OF DEFENSE SPECIFICALLY TO ADDRESS THE SOFTWARE ENGINEERING PROBLEMS OF MISSION-CRITICAL SYSTEMS. THE PROPOSED RESEARCH WILL DETERMIE HOW TO SUBSTANTIALLY IMPROVE THE CODE FOR MISSION-CRITICAL SOFTWARE GENERATED BY SOPHISTICATED ADA COMPILERS. OPTIMIZATIONS ARE COMPILER TECHNIQUES THAT PRODUCE FASTER, MORE COMPACT CODE. THIS RESEARCH WILL EVALUATE OPTIMIZATIONS NOT IMPLEMENTED IN TODAY'S BEST ADA COMPILERS, IDENTIFY THE MOST PROMISING NEW OPTIMIZATIONS, AND PERFORM INITIAL INVESTIGATION OF ALGORITHMS TO IMPLEMENT THEM IN A SOPHISTICATED COMPILER ARCHITECTURE. THE RESEARCH STARTS WITH A MIX OF SYNTHETIC AND REAL-TIME APPLICATION BENCHMARKS AND ANALYZES THE CODE PRODUCED FOR THEM FOR SEVERAL TARGET MACHINES. AREAS OF OPTIMIZATION OPPORTUNITY WILL BE EVALUATED USING THESE BENCHMARKS. THE AREAS INCLUDE LOOP TRANSFORMATIONS, TYPE MAPPING, OPTIMIZATION ACROSS COMPILATION UNITS AND OPTIMIZED TRANSLATION OF ADA-SPECIFIC FEATURES. CARE WILL BE TAKEN SO THAT OPTIMIZATIONS ARE NOT SPECIFIC TO PARTICULAR TARGET MACHINES.

TAU CORP
485 ALBERTO WY - BLDG D
LOS GATOS, CA 95030
CONTRACT NUMBER: F33615-87-C-1490
G JEFFREY GEIER
TITLE:
TRANSFER ALIGNMENT TECHNIQUES FOR HYPERSONIC WEAPON AP
TOPIC# 150 OFFICE: AFWAL/AA

SUBMITTED BY

THE FUNDAMENTAL OBJECTIVES OF THIS PROPOSED EFFORT ARE TO SPECIFY A TRANSFER ALIGNMENT ALGORITHM APPROPRIATE FOR A HYPERSONIC WEAPON SYSTEM, AND TO DEFINE A SIMULATION APPROPRIATE FOR EVALUATION OF THE PROPOSED ALGORITHM. IN ACHIEVING THESE OBJECTIVES, CURRENT TRANSFER ALIGNMENT APPROACHES MUST FIRST BE EXAMINED FOR POSSIBLE DIRECT APPLICATION IN THE HYPERSONIC ENVIRONMENT, WITH THEIR POTENTIAL DEFICIENCIES AND/OR INADEQUACY IDENTIFIED. A SET OF REQUIREMENTS FOR HYPERSONIC WEAPON TRANSFER ALIGNMENT WILL BE SPECIFIED AS PART OF THIS EFFORT. A TRANSFER ANALYSIS WILL BE COMPLETED. FINALLY, A MORE EXTENSIVE MONTE CARLO SIMULATION WILL BE DEFINED FOR FURTHER ALGORITHM EVALUATIONS TO BE PERFORMED IN PHASE II. THIS SIMULATION CAN BE ADAPTED FROM TAU CORPORATION'S INTEGRATED NAVIGATION SYSTEM SIMULATION.

TAU CORP
485 ALBERTO WY - BLDG D
LOS GATOS, CA 95030
CONTRACT NUMBER: F33615-87-C-0193
PATRICK CIGANER
TITLE:
KNOWLEDGE-BASED ATTACK PLANNING AND STEERING IN BEYOND RANGE ENGAGEMENTS
TOPIC# 162 OFFICE: ASD/XR

THE HIGHLY SOPHISTICATED PERFORMANCE CHARACTERISTICS OF THE ADVANCED TACTICAL FIGHTER CALL FOR THE DESIGN AND DEVELOPMENT OF PILOT AIDS WHICH WILL HELP ENHANCE AND STABILIZE OPERATOR PERFORMANCE THROUGHOUT THE MISSION CYCLE BY IMPROVING SITUATIONAL AWARENESS AS WELL AS REDUCING WORKLOAD. THIS PROJECT WILL EXPLORE THE FEASIBILITY OF USING A PRACTICAL KNOWLEDGE-BASED SCHEME TO DEFINE AND DISPLAY BEYOND VISUAL RNGE (BVR) ATTACK OPTIONS AND RECOMMENDATIONS. THESE RECOMMENDATIONS WILL TAKE INTO ACCOUNT THREAT EVALUATIONS, TACTICAL KNOWLEDGE, STEERING LAWS, AND MISSILE LAUNCH CONSIDERATIONS. THIS PROJECT COMPLEMENTS THE AIR-TO-AIR ATTACK MANAGEMENT (A3M) PROGRAM, IN WHICH TAU, AS A MAJOR SUBCONTRACTOR, IS ALREADY DEVELOPING THE SENSOR AND ALGORITHM MANAGERS. THE GOAL OF THIS SBIR PROJECT IS TO SHOW SPECIFICALLY HOW A KNOWLEDGE-BASED SYSTEM CAN BE USED TO ORGANIZE AND EMPLOY EXISTING STEERING LAWS IN REAL-TIME TO ENHANCE MISSION PERFORMANCE IN EXISTING AND PLANNED HIGH PERFORMANCE FIGHTERS.

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TAWD SYSTEMS INC
444 CASTRO ST
MOUNTAIN VIEW, CA 94041
CONTRACT NUMBER: F33615-87-C-1472
CHARLES D ALLEN
TITLE:
NATIONAL AEROSPACE PLANE COMMND CONTROL COMMUNICATIONS REQUIREMENTS
TOPIC# 145 OFFICE: AFWAL/AA

THE NASP C3 STUDY WILL IDENTIFY AND DEVELOP COMMUNICATIONS AND DATA TRANSMISSION INTERFACES FOR THE NASP PROGRAM BASED THE CURRENT NASP OPERATIONAL CONCEPT AND ON PLANNED MISSION SCENARIOS. CURRENTLY, THE OPTIONS COVERING INTENDED MISSIONS, VEHICLE TYPE AND FLEET SIZE ARE OPEN ENDED AND WHILE COMMUNICATIONS AND DATA TRANSMISSION REQUIREMENTS WILL NECESSARILY VARY ACCORDING TO THE SELECTED OPTION CHARACTERISTICS. VIABLE OPTION CANDIDATES WILL BE STUDIED AND APPROPRIATE COMMUNICATIONS AND DATA LINK INTERFACES FOR EACH WILL BE IDENTIFIED. THE NASP MAY ALSO BENEFIT FROM PROPOSED INTEROPERABILITY IMPROVEMENTS PLANNED UTILIZING THE NEW SPACE DATA LINK STANDARD (SDLS) AND SATELLITE COMMUNICATIONS CROSSLINKS. ANOTHER CRITICAL ISSUE THAT WILL BE EXPLORED IS THE MODERNIZATION OF THE USAF SATELLITE CONTROL NETWORK'S (AFSCN) COMMUNICATION CAPABILITIES, AND COMMAND AND CONTROL INTERFACES. THE UPGRADES NOW UNDERWAY WILL CERTAINLY INFLUENCE THE NASP OPERATIONAL SUPPORT. THE SIGNIFICANCE OF THESE NETWORK CHANGES MAY IMPACT NASP C3 SYSTEMS CONFIGURATIONS AND PERFORMANCE REQUIRING NASP C3 DESIGN RECONSIDERATIONS, OR RECOGNITION OF NASP OPERATIONAL LIMITATIONS. ALSO, THE STUDY MAY UNCOVER OTHER C3 IMPACTS OR OBSTACLES FOR PARTICULAR OPTIONS THAT HAVE NOT BEEN ADDRESSED.

TECH TEAM INC
16621 SE 21ST PL
BELLEVUE, WA 98008
CONTRACT NUMBER: 87-C-0361
B JONER/J W WILLIAMS
TITLE:
CONCEPTS FOR ADVANCED WEAPON SUSPENSION DEVICES
TOPIC# 8 OFFICE: AFATL/FAV

SUBMITTED BY

SEVERAL DEVICES FOR SUSPENSION OF ADVANCED STAND-OFF WEAPONS AND MISSILES FROM EXISTING BOMB RACKS AND MISSILE HANGERS ATTACHED TO AN AIRCRAFT WILL BE CONCEPTUALLY DEVELOPED. THE DEVICES WITH NO OR MUCH REDUCED DRAG WHEN THE WEAPON IS RELEASED WILL INCREASE THE FLYING/FALLING CHARACTERISTICS AND PERFORMANCE OF THE WEAPON. THE DEVICE(S) WHICH AFTER THE CONCEPTURAL DEFINITION SHOW(S) A POTENTIALITY FOR MEETING THE OPERATIONAL REQUIREMENT WILL BE THE OBJECT FOR PRELIMINARY DESIGN IN SUFFICIENT DETAILS TO PERMIT EVALUATION AND SELECTION OF THE DEVICE WHICH WILL BEST MEET THE REQUIREMENTS AND SHOULD BE THE OBJECT FOR PROTOTYPE DESIGN, FABRICATION AND TESTING IN FOLLOW-ON PHASE(S).

TECHNICAL RESEARCH ASSOCS
410 CHIPETA WY - STE 222
SALT LAKE CITY, UT 84108
CONTRACT NUMBER: F33615-87-C-5282
GAIL BOWERS-IRONS
TITLE:
THE BIODEGRADATION OF POLYURETHANE PAINT
TOPIC# 101 OFFICE: AFWAL/ML

RECENT WORK IN THE FIELD OF BIODEGRADATION INDICATES THAT EXISTING HAZARDOUS AND COSTLY PROCEDURES COULD BE REPLACED BY MICROBIAL TECHNIQUES. MICROBIAL DEGRADATION IS SAFER AND TARGET SELECTIVE AND PROBLEMS ASSOCIATED WITH COMPLICATED GEOMETRIES, NON-LINEAR SURFACES, ARE ELIMINATED. THE AIR FORCE PAINT PRODUCT LINE, MANUFACTURED BY COMPANIES SUCH AS DEFT AND DESOTO ARE WATER-THINNED, POLYURETHANE SYSTEMS THAT DO NOT CONTAIN FUNGICIDES AND BACTERICIDES. IT IS TECHNICAL RESEARCH ASSOCIATES' BELIEF THAT THESE PAINTS CAN BE PENETRATED BY BACTERIA AND SAFELY REMOVED FROM THE ALUMINUM AND TITANIUM ALLOYS AS WELL AS OTHER CARBON FIBER OR COMPOSITE MATERIALS.

TECHNOCHEM CO
PO BOX 4443
GREENSBORO, NC 27404
CONTRACT NUMBER: F33615-87-C-2783
DR SHYAM D ARGADE
TITLE:
CHLORINE ELECTRODES FOR MOLTEN SALT BATTERIES
TOPIC# 124 OFFICE: AFWAL/PO

AD-A195 720 DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM (SBIR) VOLUME 3 AIR FORCE ABSTRACTS OF PHASE 1 AWARDS 1987(U) DEPARTMENT OF DEFENSE WASHINGTON DC APR 88 3/3

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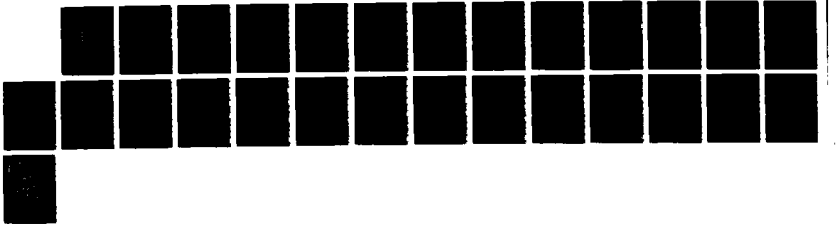

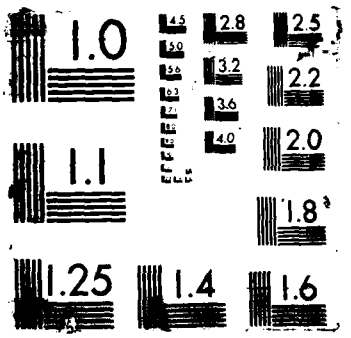
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FUTURE MILITARY SPACE MISSIONS WILL REQUIRE 10-100 KILOWATTS OF SUSTAINED POWER WITH PEAK/PULSE POWER LEVELS OF 100 KW TO 100 MW. ELECTROCHEMICAL ENERGY STORAGE SYSTEMS WHICH CAN DELIVER HIGH POWER DENSITY YET OFFER HIGH ENERGY DENSITY NEED TO BE DEVELOPED. THESE RECHARGEABLE BATTERIES MUST HAVE DURABILITY AND COMPOSITION INVARIANCE FOR OVER 30,000 CYCLES. BOTH OF THE ELECTRODE REACTIONS IN THE METAL-CHLORINE SYSTEMS ARE ORDERS OF MAGNITUDE FASTER THAN THOSE IN THE AMBIENT BATTERY SYSTEMS. THEREFORE, THESE SYSTEMS HAVE THE POTENTIAL OF DELIVERING EXCEEDINGLY HIGH POWER LEVELS WITH RESPECTABLE ENERGY DENSITIES. USING CHLORIDE-CONTAINING MELTS, SUITABLE METAL ELECTRODES AND APPROPRIATE FABRICATING TECHNIQUES AND MATERIALS, LONG CYCLE LIFE AND CYCLE-TO-CYCLE COMPOSITION INVARIANCE CAN ALSO BE ACHIEVED. THE PROPOSED PHASE I PROGRAM IS ORIENTED TOWARDS DEVELOPING CHLORINE ELECTRODES FOR MOLTEN SALT METAL-CHLORINE BATTERIES THAT CAN DELIVER HIGH POWER LEVELS AND A STABLE PERFORMANCE. METHODS OF ACTIVATION FOR GRAPHITE AND CARBON WILL BE EXPLORED IN THE DEVELOPMENT OF THESE ELECTRODES. ASPECTS OF BATTERY SYSTEM DESIGN WILL ALSO BE INVESTIGATED TO A LIMITED EXTENT.

TECHNOLOGY & MANAGEMENT SYSTEMS INC (TMS
99 S BEDFORD ST - STE 211
BURLINGTON, MA 01803
CONTRACT NUMBER:
DR PRAFULLA (PAUL) MAHATA
TITLE:
FEASIBILITY STUDY ON ULTRA-HIGH EFFECTIVENESS HEAT EXC
TOPIC# 221 OFFICE: BMO/MYSC

TO INVESTIGATE THE FEASIBILITY OF ULTRA-HIGH EFFECTIVENESS HEAT EXCHANGERS, WHICH ARE PRIMARILY SUITED FOR ICBM DEEP BASE PROGRAM. THE STUDY WILL INCLUDE DEVELOPMENT OF INNOVATIVE AND NOVEL CONCEPTUAL DESIGNS OF AN AIR-TO-WATER HEAT EXCHANGER, AN EVAPORATOR, AND A CONDENSER. FOR THE PURPOSE OF REDUCING ELECTRIC POWER CONSUMPTION DURING EGRESS PERIOD OF THE ICBM DEEP BASE OPERATION, IT IS IMPORTANT THAT ULTRA-HIGH EFFECTIVENESS HEAT EXCHANGERS ARE USED IN CONJUNCTION WITH ULTRA-HIGH EFFICIENCY HEAT PUMPS. THIS PROPOSAL PROVIDES WAYS TO DEVELOP SUCH HEAT EXCHANGERS THROUGH PHASE I TASKS, IN WHICH WE WILL 1) GATHER INFORMATION ON HIGH EFFECTIVENESS HEAT EXCHANGERS; 2) INVESTIGATE AND EVALUATE SEVERAL CANDIDATE HEAT EX-

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CHANGERS, INCLUDING DIRECT CONTACT HEAT EXCHANGERS AS EVAPORATOR AND HEAT PIPES AS CONDENSERS; AND 3) FINALLY, DEVELOP CONCEPTUAL DESIGNS OF ULTRA-HIGH EFFECTIVENESS HEAT EXCHANGERS. THE GAIN IN THERMAL EFFECTIVENESS IN NOVEL HEAT EXCHANGERS WILL BE QUANTIFIED AND FEASIBILITY OF SUCH HEAT EXCHANGERS WILL BE DETERMINED.

TECHNOLOGY DEVELOPMENT ASSOCS INC
3160 GALENA WY
BOULDER, CO 80303
CONTRACT NUMBER: F33615-87-C-2788
MICHAEL KARPUK
TITLE:
METHANOL AS A HEAT-SINK FOR HYPERSONIC AIRCRAFT
TOPIC# 133 OFFICE: AFWAL/PO

HYPERSONIC FLIGHT REQUIRES COOLING OF THE LEADING EDGE OF THE AIRFOILS AND INTERNAL ENGINE PARTS. THIS COOLING CAN BE PROVIDED BY ENDOTHERMIC FUEL REACTIONS. METHANOL DISSOCIATION CAN PROVIDE MORE HEAT SINK CAPACITY THAN PREVIOUSLY PROPOSED REACTIONS SUCH AS THE DEHYDROGENATION OF METHYLCYCLOHEXANE. METHANOL DECOMPOSITION CATALYSTS WILL BE PREPARED THAT HAVE HIGH ACTIVITY AND SELECTIVITY TO METHANOL DECOMPOSITION, HIGH TEMPERATURE STABILITY AND HIGH MECHANICAL STRENGTH. THESE CATALYSTS WILL BE TESTED IN A PLUG FLOW MICROCATALYTIC REACTOR. DATA FROM THE TESTS WILL BE USED TO PERFORM A SYSTEMS ANALYSIS TO DETERMINE THE MISSION BENEFITS PROVIDED BY THE DISSOCIATED METHANOL HEAT SINK TO HYPERSONIC AIRCRAFT.

TECHNOLOGY DEVELOPMENT CORP
621 SIX FLAGS DR
ARLINGTON, TX 76011
CONTRACT NUMBER:
PAUL T ECKERT
TITLE:
DEVELOPMENT OF THE TEXTUAL AUTOMATED REDUCTION SYSTEM
TOPIC# 83 OFFICE: AMD/RDO

THE USE OF EXPERT SYSTEM TECHNOLOGY TO PROVIDE AID TO NOVICE AIR FORCE PERSONNEL IN THE PERFORMANCE OF THEIR JOBS IS A NATURAL OUT-

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GROWTH OF BOTH CURRENT EXPERT SYSTEM TECHNOLOGY AND THE NEED FOR BETTER COMPUTER-AIDED JOB ASSISTING AND JOB TRAINING. TDC HAS DEFINED AND DEVELOPED A PROTOTYPE METHODOLOGY FOR THE SEMIAUTOMATED ACQUISITION OF OBJECTS (I.E., LEXICAL TERMS OR DICTIONARY ENTRIES) AND THE SIMULTANEOUS, SEMI-AUTOMATIC ELUCIDATION OF RULES FROM TEXT SOFTWARE DOCUMENTS WHICH ARE TAINING GUIDES OR AUTOMATED TRAINING GUIDES. THESE GUIDES ARE WRITTEN IN NATURAL LANGUAGE, AND THE DEVELOPMENT OF EXPERT TRAINING SYSTEMS OR EXPERT JOB AIDING ALWAYS REQUIRES THAT A KNOWLEDGE ENGINEER REDUCE THE TRAINING DATA INTO EXPERT RULES FOR A RULE BASE. THE TARS METHOD USES AN INITIAL REDUCTION OF NATURAL LANGUAGE INTO AN INTERMEDIATE ENGLISH/LOGIC LANGUAGE COMPOSITE, THEN FURTHER REDUCES THE ENGLISH/LOGIC COMPOSITE TO A FORM VERY CLOSE TO THE FINAL RULES DESIRED. THE PRELIMINARY METHODOLOGY INVOLVES A SERIES OF STEPS FOR THE KNOWLEDGE ENGINEER SIMILAR TO THE SERIES OF STEPS PERFORMED IN THE WRITING OF WELL-STRUCTURED SOFTWARE IN ALGORITHMIC LANGUAGES.

TECOLOTE RESEARCH INC
2041 E ROSECRANS AVE - STE 220
EL SEGUNDO, CA 90245
CONTRACT NUMBER: F04701-87-C-0120
JAMES H SUTTLE
TITLE:
ON-ORBIT COST BETWEEN A DISTRIBUTED SPARSE ARRAY RADAR MONOLITHIC SPACE-BASED RADAR SYSTEM
TOPIC# 175 OFFICE: SD/SPO

THE DEVELOPMENT OF A LIFE CYCLE COST (LCC) METHODOLOGY AND COST MODEL FOR COMPARING A LARGE MONOLITHIC SPACE BASED RADAR SYSTEM TO A SMALL DISTRIBUTED SPARSE ARRAY RADAR SYSTEM IS DISCUSSED. R&D, PRODUCTION, AND O&S COST FOR EACH RADAR AT WBS LEVEL 2 WILL BE DEVELOPED IN PHASE I. COST ESTIMATING RELATIONSHIPS (CERS) FOR EACH COST ELEMENT BREAKOUT UNDER THESE MAJOR PHASES WILL ESTIMATE THE COST AT THE WBS LEVEL 2 FOR EACH RADAR. THE MODEL WILL PERFORM LCC TRADES AMONG SURVIVABILITY, RELIABILITY, MISSION REQUIREMENTS, MANUFACTURING ASSUMPTIONS, LAUNCH VEHICLE CANDIDATES, AND SERVICING OPTIONS. THE DELIVERABLE DURING PHASE I WILL BE A WORKING MODEL TO BE USED BY AF DEVELOPMENT PLANNERS IN MAKING PROGRAM DECISIONS. DURING PHASE II, THE MODEL CAPABILITY WILL BE EXPANDED TO MORE DETAIL FOR EACH RADAR

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SYSTEM, ADDITIONAL TRANSPORTATION SYSTEMS WILL BE INCLUDED, AND OUTPUT COMPARISONS ENHANCED.

TERRA TEK INC
400 WAKARA WY
SALT LAKE CITY, UT 84108
CONTRACT NUMBER: F33615-87-C-3234
SIDNEY J GREEN
TITLE:
NEW TECHNOLOGY IN THE USE OF HIGH TEMPERATURE COATINGS REFERENCE FOR ULTRA HIGH TEMPERATURE STRAIN MEASURMENT
TOPIC# 109 OFFICE: AFWAL/FI

CURRENT METHODS USED TO MEASURE STRAIN AT HIGH TEMPERATURES DEPEND ON UNDESIRABLE ATTACHMENTS, EXTENSIONS, OR INDENTATIONS OF THE TEST SAMPLES. THIS STUDY WILL INVESTIGATE THE USE OF NEW TECHNOLOGY TO APPLY HIGH TEMPERATURE COATING MARKS TO TEST SAMPLES. THESE APPLIED MARKS WILL ACT AS A REFERENCE OR GAUGE FOR OPTICAL STRAIN MEASUREMENT. MATERIALS INCLUDING REFRACTORY METALS AND CERAMICS WILL BE APPLIED BY SPUTTERING OR VAPOR DEPOSITION AND WILL THEN BE EVALUATED TO DETERMINE THEIR SUITABILITY FOR THIS APPLICATION. THE APPLIED COATINGS WILL BE EVALUATED FOR THEIR QUALITY (GOOD EDGES, ETC.), THEIR RESISTANCE TO EROSION AT HIGH TEMPERATURE, AND THEIR UPPER TEMPERATURE LIMITS. THE BEST COATINGS WILL BE TESTED FOR A DISCERNABLE DIFFERENCE IN EMISSIVITY AND/OR REFLECTIVITY, AS COMPARED TO HIGH TEMPERATURE STRUCTURAL MATERIALS. FINALLY, A SYSTEM DESIGN WILL BE COMPLETED THAT MAKES USE OF THE INFORMATION GAINED IN THIS STUDY. THIS SYSTEM WILL INCLUDE DESIGNS FOR THE EQUIPMENT FOR COATING (MARKING) THE TEST STRUCTURE, THE OPTICAL EQUIPMENT FOR PRECISE HIGH TEMPERATURE STRAIN MEASUREMENT, AND THE COMPUTER EQUIPMENT AND SOFTWARE NECESSARY TO INTERPRET THE SIGNALS FROM DIGITAL OPTICAL EQUIPMENT. THIS SYSTEM WILL THEN BE READY FOR CONSTRUCTION AND ACTUAL LABORATORY TESTING IN PHASE II.

TERRA TEK INC
400 WAKARA WY
SALT LAKE CITY, UT 84108
CONTRACT NUMBER:
A MAHYERA
TITLE:
ADVANCED CUTTER DEVELOPMENT FOR EGRESS BORING MACHINES
TOPIC# 209 OFFICE: BMO/MYSC

SUBMITTED BY

CURRENT EGRESS BORING MACHINES, UTILIZING CONVENTIONAL 17-INCH DISC CUTTERS, ARE CAPABLE OF ACHIEVING MAXIMUM ADVANCE RATES OF 80 FEET PER HOUR, BECAUSE OF CUTTER LIMITATIONS. THE AIR FORCE HAS DETERMINED THAT NATIONAL NEEDS REQUIRE SUBSTANTIALLY FASTER BORING RATES. ALSO, IT IS CRUCIAL THAT THE CUTTERS BE CAPABLE OF COMPLETING THE EGRESS SHAFT, WITHOUT ANY MAINTENANCE/REPLACEMENT OF THE CUTTERS. CURRENT CUTTERS, THAT HAVE EVOLVED ESSENTIALLY AS A RESULT OF TRIAL-AND-ERROR EXPERIMENTS, DESIGN COMPROMISES, AND MANUFACTURING LIMITATIONS, FALL FAR SHORT OF THE AIR FORCE'S GOAL. EXISTING DESIGNS ARE OFTEN SUBJECT TO BOTH BEARING AND CUTTER FAILURES, EVEN WHEN OPERATED BELOW RATED THRUST LEVELS. PROPOSED HEREIN IS AN INNOVATIVE ANALYTICAL-CUM-EXPERIMENTAL STUDY, CENTERED AROUND THE CONCEPT OF A ONE-PIECE HUB/CUTTER RING STRUCTURE. MATERIALS BETTER SUITED FOR THE CUTTER STRUCTURE AND BEARING ELEMENTS HAVE BEEN SELECTED AND DESIGNS PROPOSED FOR EVALUATION IN PHASE I. THE BEST OF THESE WILL BE INCORPORATED TO DEVELOP BASIC CRITERIA TO BE APPLIED FOR DETAILED DESIGN/DEVELOPMENT OF THE CUTTERS IN PHASE II.

TERRA TEK INC
400 WAKARA WY
SALT LAKE CITY, UT 84108
CONTRACT NUMBER:
GREGORY J BELL
TITLE:
HIGH-EFFECTIVENESS ASCENDING THERMAL ENERGY REJECTION SUBTERRANEAN APPLICATION
TOPIC# 221 OFFICE: BMO/MYSC

DEEP-BASED ICBM SITES MUST BE MAINTAINED AT A CONSTANT WORKING TEMPERATURE FOR THE BENEFIT OF PERSONNEL AND SENSITIVE ELECTRICAL EQUIPMENT WITHIN THE FACILITY. HOWEVER, HEAT IS GENERATED WITHIN THE FACILITY FROM A VARIETY OF SOURCES AND THERE IS A NATURAL FLOW OF HEAT FROM THE WARM ROCK MASS SURROUNDING THE SITE INTO THE UNDERGROUND STRUCTURE. IT IS PROPOSED TO DESIGN AND TEST AN EFFICIENT SYSTEM OF EQUIPMENT TO REMOVE THE EXCESS THERMAL ENERGY FROM THE FACILITY AND REJECT IT TO THE SURROUNDING ROCK MASS BY WAY OF A GRAVITY-OPERATED EARTH-COUPLED HEAT PIPE IN COMBINATION WITH AN EFFICIENT HEAT PUMP. THE COUPLING OF THE HEAT PUMP CONDENSER TO THE HEAT PIPE EVAPORATOR WILL BE MADE EFFICIENT BY USING AN EFFECTIVE HEAT EXCHANGER. THE

SUBMITTED BY

HEAT PIPES ARE INSTALLED WITH A SLIGHT INCLINE FOR LONG DISTANCES BY UTILIZING IN-MINE HORIZONTAL DRILLING CAPABILITIES.

TEXTILE TECHNOLOGIES INC
2800 TURNPIKE DR
HATBORO, PA 19040
CONTRACT NUMBER: F33615-87-C-2793
STEPHEN P ZAWISLAK
TITLE:
ANGULAR WEAVING FOR TURBINE ENGINE COMPOSITE COMPONENT
TOPIC# 137 OFFICE: AFWAL/PO

ADVANCED AIRCRAFT ENGINES REQUIRE ADVANCED MATERIALS TO MEET THEIR GOALS OF PERFORMANCE, THRUST-TO-WEIGHT RATIO AND FUEL EFFICIENCY. OF ALL THE TECHNIQUES AVAILABLE FOR FABRICATING COMPOSITE REINFORCEMENT MATERIALS, NOT ONE TECHNIQUE CAN PROVIDE THE VERSATILITY TO FEASIBLY PRODUCE RELIABLE MULTIDIRECTIONAL STRUCTURAL COMPONENTS. THE MAJOR OBJECTIVE OF THIS PROPOSAL IS TO ADVANCE THE LEVEL OF MATERIALS IN ORDER TO CONTRIBUTE TO IMPROVING THE PERFORMANCE LIFE, RELIABILITY, STRUCTURAL EFFICIENCY AND/OR TO REDUCE COST OF FUTURE TURBINE ENGINES. THE MAJOR EMPHASIS OF THIS WORK WILL BE DIRECTED TOWARDS DEVELOPING A COMPOSITE REINFORCEMENT FABRICATION SYSTEM WHICH WILL ADDRESS ALL THE LIMITATIONS ASSOCIATED WITH STATE-OF-THE-ART TECHNIQUES. TO EFFICIENTLY AND COST EFFECTIVELY FABRICATE THREE-DIMENSIONAL MULTI-LAYER, MULTI-ANGULAR STRUCTURAL COMPOSITE PERFORMS, A NEW FABRICATION MACHINE MUST BE FIRST DESIGNED (PHASE I) AND THEN FABRICATED (PHASE II) BASED ON INPUT NOT ONLY FROM THE TEXTILE ENGINEER, BUT ALSO THE TURBINE ENGINE DESIGNER.

THERMACOR TECHNOLOGY INC
2697 LAVERY CT - #9
NEWBURY PARK, CA 91320
CONTRACT NUMBER:
JACK G BITTERLY
TITLE:
FREON(TM) 114-BASED CLOSED CYCLE BODY COOLING DEVICE
TOPIC# 76 OFFICE: AMD/RDO

SUBMITTED BY

PROPOSED IS THE RESEARCH AND DEVELOPMENT NECESSARY TO DEMONSTRATE THE FEASIBILITY OF A VAPOR REFRIGERATION CYCLE WHICH IS CAPABLE OF DIRECTLY AND CONTINUALLY COOLING AREAS OF THE BODY THROUGH THE LIQUID-TO-GAS PHASE CHANGE OF FREON 114 AT THE SITE TO BE COOLED. A PRE-DEVELOPMENT LABORATORY PROTOTYPE WILL BE BUILT AND DEMONSTRATED WHICH (a) ELIMINATES THE NEED FOR A PUMP TO TRANSFER COOLING MEDIUM TO THE BODY, (b) ELIMINATES THE BUILDUP OF DANGEROUS GAS PRESSURES IN THE VEST, (c) ELIMINATES THE DANGER OF FREEZING TISSUE, (d) OPERATES SUCCESSFULLY IN HIGH AMBIENT TEMPERATURES, (e) PROVIDES FOR CONTINUOUS HIGH COOLING RATES ON DEMAND SO LONG AS IT HAS POWER, AND (f) MAKES POSSIBLE THE DEVELOPMENT IN PHASE II OF A MINIATURIZED VERSION WHICH WILL HAVE ALL THE FOREGOING ATTRIBUTES AS WELL AS BEING SMALLER AND MUCH LIGHTERWEIGHT THAN EXISTING PORTABLE DEVICES FOR AUXILIARY COOLING.

THERMACORE INC
780 EDEN RD
LANCASTER, PA 17601
CONTRACT NUMBER:
JOHN HARTENSTINE
TITLE:
DEEP BASE HEAT REJECTION METHODS
TOPIC# 221 OFFICE: BMO/MYSC

THE ICBM DEEP BASE PROGRAM WILL EQUIP AN UNDERGROUND FACILITY WITH ALL OF THE LIFE SUPPORT EQUIPMENT NECESSARY FOR HUMAN SURVIVAL DURING THE POST-ATTACK PHASE OF A NUCLEAR WAR. THESE SYSTEMS WILL INCLUDE POWER GENERATION, CO2 REMOVAL ETC., AND THE HEAT GENERATED BY OPERATING THESE SYSTEMS MUST BE DISSIPATED TO THE SURROUNDING ROCK STRATA TO KEEP THE UNDERGROUND HABITAT AT AN COMFORTABLE TEMPERATURE. ONE CURRENT HEAT REJECTION METHOD USES HEAT PIPES (100 FEET LONG) IMBEDDED IN THE SURROUNDING ROCK WALLS ATTACHED TO THE HEAT SOURCES BY CONVENTIONAL HEAT EXCHANGERS. THIS PROPOSAL IDENTIFIED A PROGRAM TO INVESTIGATE THE ADVANTAGES OF USING A HEAT PUMP TO ELEVATE THE WASTE HEAT TEMPERATURE BEFORE COUPLING TO THE HEAT REJECTION HEAT PIPE. THE HIGHER TEMPERATURE WASTE HEAT WILL ALLOW THE HEAT PIPE LENGTHS TO BECOME SUBSTANTIALLY SHORTER AND LESS EXPENSIVE TO FABRICATE AND INSTALL. ALTERNATIVE SYSTEM CYCLES, MATERIALS, RELIABILITY, AND THE USE OF WASTE HEAT FROM THE POWER GENERATOR TO DRIVE

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THE HEAT PUMP WILL BE EVALUATED. BASED ON THESE EVALUATIONS, A CYCLE WILL BE CHOSEN AND A PROTOTYPE HEAT PUMP WILL BE DESIGNED TO MEET THE DEEP BASE REQUIREMENTS.

TOOMAY MATHIS & ASSOCS INC
PO BOX 3118
BOZEMAN, MT 59772
CONTRACT NUMBER:
JOHN C STOVER
TITLE:
ANALYSIS OF PROCESS INDUCED DAMAGE BY SUBSURFACE SCATT MEASUREMENT
TOPIC# 65 OFFICE: RADC/XPX

LIGHT SCATTERED FROM CLEAN SEMICONDUCTOR WAFERS IS DUE TO BOTH SURFACE AND SUBSURFACE DEFECTS. SCATTER FROM SURFACE DEFECTS GENERALLY DOMINATES BY AN ORDER OF MAGNITUDE OR TWO. A METHOD TO SEPARATE SUBSURFACE SCATTER FROM SURFACE SCATTER HAS BEEN FOUND, AND IT IS PROPOSED HERE TO UTILIZE THAT TECHNIQUE TO INDICATE THE LOCATION AND AMPLITUDE OF SUBSURFACE DEFECTS BY COLOR MAPPING THE LOCATION AND INTENSITY OF SUBSURFACE SCATTER. THE PROPOSED DESIGN WILL ALLOW FAST MAPPING OF SEMICONDUCTOR WAFERS AT ADJUSTABLE RESOLUTIONS AND WILL PROVIDE FEEDBACK INFORMATION TO HELP IMPROVE THE PROCESSES USED TO FABRICATE III-IV AND II-V SEMICONDUCTOR WAFERS. MAPPING SPEEDS IN EXCESS OF ONE MILLION PIXELS/MINUTE ARE BELIEVED POSSIBLE IN A PHASE II VERSION OF THE INSTRUMENT. THE INFORMATION AVAILABLE FROM THE SYSTEM IS EXPECTED TO HAVE A VERY POSITIVE IMPACT ON REDUCING IN PROCESS DAMAGE IN II-V AND III-IV WAFERS.

TOYON RESEARCH CORP
PO BOX 6890
SANTA BARBARA, CA 93160
CONTRACT NUMBER: F04701-87-C-0118
MICHAEL GRACE
TITLE:
DETERMINATION OF COUNTERMEASURES TO BISTATIC RADAR
TOPIC# 174 OFFICE: SD/SPO

SUBMITTED BY

THE REVIVAL OF INTEREST IN BISTATIC RADAR SYSTEMS OVER THE PAST DECADE HAS RAISED QUESTIONS ABOUT THESE SYSTEMS' SUSCEPTIBILITY TO COUNTERMEASURES. BISTATIC RADARS HAVE GOOD INHERENT ECCM CAPABILITY BECAUSE THE RECEIVER'S POSITION IS NOT READILY DETERMINED, FORCING JAMMERS TO EMPLOY WIDE ANGLE ANTENNA PATTERNS, THUS REDUCING THEIR ERP. NEW APPLICATIONS OF BISTATIC RADAR TO FUNCTIONS TRADITIONALLY PERFORMED BY MONOSTATIC RADARS REQUIRE A HIGH DEGREE OF COORDINATION BETWEEN TRANSMITTER AND RECEIVER OVER LARGE DISTNCES. THIS COORDINATION CREATES COMPLEX PROBLEMS BEYOND THOSE FOUND IN MONOSTATIC APPLICATIONS. THE GEOMETRY OF BISTATIC SYSTEMS ALSO MAKES THEM SUSCEPTIBLE TO AMBIGUITY PROBLEMS NOT GENERALLY ENCOUNTERED IN MONOSTATIC RADARS. THESE QUALITIES SUGGEST ADDITIONAL VULNERABILITY TO ECM. IN THIS ACTIVITY, A STUDY WILL BE MADE OF THESE VULNERABILITIES IN THE PARTICULAR BISTATIC SYSTEM HAVING A SPACEBORNE TRANSMITTER AND AN AIRBORNE RECEIVER WITH THE INTENT OF IDENTIFYING NEW CHANNELS FOR COUNTERMEASURE ATTACK.

TOYON RESEARCH CORP
PO BOX 6890
SANTA BARBARA, CA 93160
CONTRACT NUMBER:
JOEL R GARBARINO
TITLE:
OPTIMAL MaRV TRAJECTORIES CONSIDERING DEFENSE RADAR AN INTERCEPTOR LIMITATIONS
TOPIC# 219 OFFICE: BMO/MYSC

IN MANEUVERING REENTRY VEHICLE ENGAGEMENT STUDIES, IT IS USUALLY NECESSARY TO DRIVE A SET OF "EFFECTIVE" EVASION TRAJECTORIES TO OBTAIN A REALISTIC ESTIMATE OF THE PENETRATION CAPABILITY OF THE OFFENSE. ANALYTIC TECHNIQUES AND SMALL COMPUTER CODES HAVE BEEN DEVELOPED TO TREAT EVASION PERFORMANCE OF THE MaRV RELATIVE TO THE INTERCEPTOR, BUT HAVE IGNORED THE PROBLEMS SUCH AS VECHICLE IMPOSES ON THE RADAR. ONE SUCH FACTOR IS THAT THE WIDER THREAT TUBE AVAILABLE WITH THE MaRV MAY STRESS THE RADAR SEARCH PERFORMANCE TO THE POINT THAT LEAKAGE OCCURS. IN THIS ACTIVITY, AN EXAMINATION OF THE COMBINED EFFECTS OF EVASION AND THREAT TUBE WIDENING (AND THE PROPER MIX ONE SHOULD USE) WILL BE CONDUCTED. A METHODOLOGY (AND ULTIMATELY A SMALL COMPUTER CODE) WILL BE DEVELOPED FOR DETERMINING THE OPTIMAL

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MaRV TRAJECTORY MIX AND THE RESULTANT PENETRATION EFFECTIVENESS AS A FUNCTION OF OFFENSE/DEFENSE CHARACTERISTICS.

TOYON RESEARCH CORP
PO BOX 6890
SANTA BARBARA, CA 93160
CONTRACT NUMBER:
JOHN ISE
TITLE:
RADIO FREQUENCY (RF) PROPAGATION PREDICTIONS THROUGH N
TOPIC# 230 OFFICE: BMO/MYSC

DURING THE PAST TWENTY-FIVE YEARS, SEVERAL COMPUTER CODES HAVE BEEN DEVELOPED TO PREDICT VARIOUS RADAR EFFECTS CONCERNING PROPAGATION THROUGH NUCLEAR FIREBALLS. FOR THE MOST PART, THESE HAVE BEEN DESIGNED EXCLUSIVELY FOR GROUND-BASED ABM RADARS. THIS PROPOSED STUDY IS DESIGNED TO PERMIT CALCULATION OF ALL RADAR EFFECTS AFFECTING PROPAGATION FROM ARBITRARY PLATFORMS, IN SPACE AS WELL AS GROUND-BASED. TO THIS END, A THOROUGH STUDY OF ALL AVAILABLE DATA ON RADAR PROPAGATION THROUGH NUCLEAR FIREBALLS WOULD BE MADE, U.S. AS WELL AS FOREIGN. A SIMILAR STUDY WOULD BE MADE FOR INFORMATION FROM SIMULATED BURSTS AND NATURAL PHENOMENA. FROM THIS DATA AN ANALYTIC MODEL OF RADAR PROPAGATION EFFECTS (ABSORPTION, REFRACTION, SCATTERING, SCINTILLATION AND COHERENT PHASE EFFECTS, AS WELL AS FIREBALL NOISE RADIATION) WOULD BE CONSTRUCTED AND COMPARED WITH PREDICTIONS OF SUCH DNA CODES AS WESCOM AND NORSE. FINALLY, A CODE STRUCTURE WOULD BE DESIGNED TO PERMIT, DURING PHASE II, CONSTRUCTION OF A FAST-RUNNING, MODULAR, USER-FRIENDLY COMPUTER CODE FOR RADAR PROPAGATION FROM ARBITRARY PLATFORMS.

TRANSDUCER RESEARCH INC
1128 OLYMPUD DR
NAPERVILLE, IL 60540
CONTRACT NUMBER:
JOSEPH R STETTER
TITLE:
A MICROCHEMICAL DETECTION AND ALERTING SYSTEM
TOPIC# 79 OFFICE: AMD/RDO

SUBMITTED BY

NEW AND IMPROVED CHEMICAL DETECTION AND ALERTING SYSTEMS ARE NEEDED FOR DEFENSE AGAINST CHEMICAL WARFARE AGENTS. ONE USEFUL APPROACH HAS BEEN THE DEVELOPMENT OF ELECTROCHEMICAL SENSORS AND SOME OF THESE ARE NOW IN PRODUCTION. HOWEVER, A MORE SELECTIVE, SENSITIVE, RUGGED, SMALL, AND LOWER COST SENSOR IS NEEDED. IN THE PROPOSED STUDY, TWO TECHNOLOGIES ARE COMBINED: ELECTROCHEMISTRY OR ELECTROCHEMICAL SENSORS AND MICRO-FABRICATION TECHNOLOGY. THE SENSING TECHNOLOGY NOW IN USE WILL BE MODIFIED AND MICROFABRICATED (MINIATURIZED). SEVERAL NEW MICROSENSOR STRUCTURES THAT OPERATE ON AN ELECTROCHEMICAL DETECTION PRINCIPLE WILL BE DESIGNED AND FABRICATED AND TESTED. THE ANALYTICAL CHARACTERISTICS OF THE MODIFIED SENSORS (I.E., MODIFIED TO BE COMPATIBLE WITH MICROFABRICATION TECHNOLOGY) WILL BE USED TO ASSESS THE FEASIBILITY OF USING THESE SYSTEMS AS FIELD RUGGED LOW-COST ALTERNATIVES TO THE PRESENT SENSOR SYSTEMS. THIS APPROACH PROMISES TO OFFER SEVERAL ADVANTAGES INCLUDING SMALL SIZE, LOW-COST, CONTROL OF PURITY AND HENCE CHEMICAL PERFORMANCE, AND RUGGEDNESS.

TREADWELL CORP
128 E 56TH ST
NEW YORK, NY 10022
CONTRACT NUMBER:
R J LAWRENCE
TITLE:
ADVANCED FUEL CELLS
TOPIC# 180 OFFICE: AFSTC/XN

THE MOST CRITICAL ASPECT OF THE RADIO FREQUENCY POWER SUPPLY FOR THE NEUTRAL PARTICLE BEAM INTEGRATED EXPERIMENT IS ITS POWER TO WEIGHT RATIO. IN ADDITION, THE SPACE-QUALIFIED 45V POWER SUPPLY MUST BE ABLE TO SUPPLY 27,000 AMP PULSES DOWN TO 350 MICROSECONDS WITH ONLY A 2 - 3% VOLTAGE DROP. PROTON EXCHANGE MEMBRANE FUEL CELLS HAVE POTENTIALLY THE HIGHEST POWER TO WEIGHT RATIO OF ANY TYPE OF FUEL CELL. THE TREADWELL CORPORATION CURRENTLY HAS A 45 VOLT PROTON EXCHANGE MEMBRANE FUEL CELL UNDER DEVELOPMENT, WHICH HAS AN EXCELLENT CHANCE OF SATISFYING THE STATED SPECIFICATIONS. THE SPECIFICATIONS ARE OUTSIDE THE NORMAL OPERATING ENEVELOPE OF THE PRESENT FUEL CELL DESIGN, SO FURTHER INFORMATION AND TESTING ON THE LABORATORY PROTOTYPE WOULD BE NEEDED. TREADWELL THEREFORE, PROPOSES TO TEST ITS CURRENT PROTOTYPE PROTON EXCHANGE MEMBRANE FUEL CELL TO BE CERTAIN THAT THIS

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TECHNOLOGY WILL FILL THE STATED NEEDS.

TRI-TECH INC
4514 OLD COLUMBIA PIKE
ANNANDALE, VA 22003
CONTRACT NUMBER: F19628-87-C
JOHN P MARLOWE
TITLE:
ELECTRONIC EQUIPMENT SHELTER MATERIAL AND STRUCTURAL A
TOPIC# 29 OFFICE: ESD/XR

THIS ANALYSIS WILL EVALUATE THREE KEY CRITERIA OF TACTICAL ELECTRONIC SHELTERS: MATERIAL, STRUCTURES AND FABRICATION TECHNIQUES. THE EVALUATION WILL BE MADE AGAINST AIR FORE SHELTER DESIGN CONSIDERATIONS, WHICH ARE: WEIGHT, SHIELDING, CORROSION, STRUCTURAL INTEGRITY, DURABILITY, MAINTAINABILITY AND COST. THE GOAL OF THE ANALYSIS WILL BE TO OFFER RECOMMENDATIONS THAT WILL LEAD TO ADVANCED SHELTER DESIGNS MAKING USE OF LIGHTWEIGHT MATERIALS, APPROPARIATE STRUCTURAL DESIGN AND COST EFFECTIVE FABRICATION TECHNIQUES.

TRIANGLE RESEARCH & DEVELOPMENT CORP
PO BOX 12696
TRIANGLE PARK, NC 27709
CONTRACT NUMBER: F33615-87-C-2138
YVONNE G BRYANT
TITLE:
ENHANCED THERMAL ENERGY STORAGE IN CLOTHING WITH IMPRE
MICROENCAPSULATED PCM
TOPIC# 159 OFFICE: ASD/AE

A PHASE I PROGRAM IS PROPOSED TO INVESTIGATE AND DEVELOP AN INNOVATIVE CLOTHING MATERIAL HAVING AN ENHANCED THERMAL ENERGY STORAGE CAPABILITY. PRESENT FABRICS THAT UTILIZE MULTIPLE LAYERS OF PASSIVE INSULATION OR ACTIVE ELECTRICAL HEATING ARE RESTRICTED BY EXCESSIVE BULK AND IMPAIRED DEXTERITY OR POWER LIMITATIONS AND BATTERY WEIGHT. A NOVEL APPROACH IS PROPOSED THAT WOULD PRODUCE SIGNIFICANT THERMAL STORAGE BY INCORPORATING PHASE CHANGE MATERIALS (PCMs) WITHIN THE FIBERS THEMSELVES TO PRODUCE A LOW-BULK, LAYERED FABRIC THAT

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WOULD BE DURABLE, STABLE, WATERPROOF AND CLEANABLE. ENCAPSULATED PCMs HAVE BEEN SHOWN TO PROVIDE SIGNIFICANTLY HIGHER THERMAL ENERGY STORAGE BY UTILIZING THEIR HIGH HEAT OF FUSION DURING MELTING FROM A SOLID TO A LIQUID. SUCH A DEVELOPMENT OF NEW TECHNOLOGY TO IMPLEMENT THE USE OF THE FABRICS. THIS PHASE I PROGRAM WOULD INVESTIGATE THE CONCEPTUAL FEASIBILITY FOR PRODUCTION OF SUCH A MATERIAL, ITS KNITTING INTO A SAMPLE FABRIC, AND ITS TESTING AND COMPARISON TO A CONTROL FABRIC USING COMPUTER MODELING AND LABORATORY EXPERIMENTATION.

TTL TECHNIQUES
65 LIMEKILN PIKE
GLENSIDE, PA 19038
CONTRACT NUMBER:
GAYLORD EVEY
TITLE:
COST IMPROVEMENT FABRICATION METHODS FOR RADAR T/R MOD
TOPIC# 31 OFFICE: ESD/XR

AN INNOVATIVE MICROWAVE PACKAGING TECHNOLOGY IS PROPOSED. THIS PACKAGING PROVIDES COST EFFECTIVE PRODUCTION AND TESTING. IMPROVED ELECTRICAL CHARACTERISTICS, MECHANICAL DURABILITY OVER CONVENTIONAL PACKAGING WILL BE PROVIDED. IN THIS PROJECT SEVERAL EMERGING TECHNOLOGIES ARE UTILIZED. MICROELECTRONIC HYBRID FABRICATION TECHNIQUE IS EMPLOYED. LOW PRESSURE PLASMA TORCH TECHNOLOGY WILL BE USED FOR DEPOSITION OF AlN AS A INSULATOR WITH EXCELLENT THERMAL CONDUCTIVITY. IN ADDITION THE AlN LAYER WILL BE USED AS A DECOUPLING CAPACITOR TO COUNTERACT THE LIN INDUCTANCES. FOR COST EFFECTIVENESS AND TO IMPROVE INDUCTANCE PROBLEMS TAB TECHNOLOGY IS SUBSTITUTED FOR CONVENTIONAL WIRE BONDING. THIS TECHNOLOGY WILL EASILY LEND ITSELF TO TESTING OF THE SYSTEM PERFORMANCE. IN ADDITION MANY IMPEDANCE MATCHING PROCEDURES CAN BE IMPLEMENTED WITH UTILIZATION OF THIS TECHNOLOGY. ALSO "AIR BRIDGES" CAN COST EFFECTIVELY BE FABRICATED WITH THIS TECHNOLOGY. THE PLASMA TORCH TECHNOLOGY WILL ENABLE US TO GROW THICK CONFORMAL LAYER OF AlN AT A VERY HIGH DEPOSITION RATE, WHICH IS MORE ECONOMICAL AND COST EFFECTIVE. IN THE SAME VACUUM SYSTEM A THIN LAYER OF DENSE AlN IS REACTIVELY SPUTTERED ON TOP OF THE PREVIOUS LAYER TO COVER THE PIN HOLES OF THAT LAYER. THE ABILITY TO EFFECTIVELY DISSIPATE HEAT IN THIS PACKAGING SHOULD SIGNIFICANTLY IMPROVE ITS RELIABILITY. THE SUBSTRATE CORE MATERIAL

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IS COPPER CLADDED INVAR WHICH WILL ADD TO THE HEAT DISSIPATION CAPABILITY, MECHANICAL DURABILITY AND REDUCE WEIGHT OF THE SYSTEM.

ULTRAMET
12173 MONTAGUE ST
PACOIMA, CA 91331
CONTRACT NUMBER: 87-C-0344
ROBERT A HOLZL
TITLE:
CVD TUNGSTEN FRAGMENTING BODY
TOPIC# 1 OFFICE: AFATL/MNN

COMBINED EFFECTS BOMBLETS (CEB) ARE CURRENTLY FABRICATED OF STEEL. STUDIES HAVE INDICATED THAT AN INCREASE IN LETHALITY WOULD BE ACHIEVED IF THE CEB WERE REDESIGNED TO HAVE A TUNGSTEN BODY. PREVIOUS INVESTIGATIONS USING POWER METALLURGY (P.M.) TUNGSTEN CEB'S WERE UNSUCCESSFUL DUE TO MATERIAL CONTROL PROBLEMS. ULTRAMET PROPOSES TO DEMONSTRATE THAT TUNGSTEN CEB'S CAN BE FABRICATED BY CHEMICAL VAPOR DEPOSITION (CVD) WHICH WILL OVERCOME THE P.M. PROBLEMS. ULTRAMET ALSO PROPOSES TO DEMONSTRATE THE CEB'S FABRICATED BY CVD CAN BE MORE COST EFFECTIVE THAN STEEL CEB'S.

ULTRAMET
12173 MONTAGUE ST
PACOIMA, CA 91331
CONTRACT NUMBER:
JOHN T HARDING
TITLE:
REFRACTORY ULTRASTRUCTURES BY CVD
TOPIC# 48 OFFICE: RADC/XPX

CHEMICAL VAPOR DESPOSITION (CVD) IS THE ONLY DEPOSITION PROCESS WHICH HAS THE SPEED NECESSARY FOR BUILDING UP STRUCTURES. DEPOSITS TEND TO BE EPITAXIAL. BOTH THESE CHARACTERISTICS ARE ESSENTIAL FOR FABRICATING NANOMETER COMPOSITES, WHICH PROMISE TO COMBINE THE MECHANICAL ADVANTAGES OF METALS WITH THE ADVANTAGES OF CERAMICS, WITH NONE OF THE DISADVANTAGES. TO ACHIEVE SHARP POTENTIAL BOUNDARIES AND TO SATISFY A BUILDUP RATE OF 24 MICROMETER/H REQUIRES

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SWITCHING FROM METAL DEPOSITION CONDITIONS TO CERAMIC DEPOSITION CONDITIONS WITH NO OVERLAP WITHIN AN INTERVAL OF LESS THAN ONE SECOND. A METHOD FOR DOING THIS IS PROPOSED. A SAMPLE OF ULTRASTRUCTURE LARGE ENOUGH FOR BEND TESTS IS A DELIVERABLE UNDER PHASE I.

ULTRAMET
12173 MONTAGUE ST
PACOIMA, CA 91331
CONTRACT NUMBER:
R B KAPLAN
TITLE:
DEVELOPMENT OF THIN REFRACTORY FILMS OF TiB2 BN NbN AN FUSED SiO2 CRUCIBLES
TOPIC# 54 OFFICE: RADC/XPX

THE ABILITY TO CONTROL UNWANTED IMPURITY LEVELS DURING ELECTRONIC DEVICE FABRICATION IS ESSENTIAL TO ESTABLISHING THE DESIRED PROPERTIES FOR DEVICE RELIABILITY. IN PHASE I ULTRAMET WILL DEMONSTRATE THE FEASIBILITY OF DEPOSITING THIN, ULTRA-HIGH PURITY FILMS OF BN, TiB2, NbN AND SiC ON FUSED SiO2 CRUCIBLES. A SUCCESSFUL COMPLETION OF PHASE I WILL RESULT IN METALLIC IMPURITIES IN THE COATINGS OF 5ppm AND COATING ADHERENCE UNDER CYCLIC CONDITIONS FROM ROOM TEMPERATURE TO 1300 DEG C. BASED ON THE EXTENSIVE CVD EXPERIENCE AT ULTRAMET, WE FEEL THAT THIS PROGRAM HAS A VERY HIGH PROBABILITY OF SUCCESS.

UNIVERSAL ENERGY SYSTEMS INC
4401 DAYTON-XENIA RD
DAYTON, OH 45432
CONTRACT NUMBER: F33615-87-C-5314
RABI S BHATTACHARYA
TITLE:
DEVELOPMENT OF Ti-Li Ti-Mg Mg-Cr AND MgAl ALLOYS FILMS BEAM PROCESSING
TOPIC# 103 OFFICE: AFWAL/ML

TITANIUM ALLOYS ARE OF GREAT INTEREST IN THE AEROSPACE INDUSTRY BECAUSE OF THEIR HIGH SPECIFIC STRENGTH, GOOD FRACTURE RELATED BE-

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HAVIOR AND GENERALLY BETTER CORROSION BEHAVIOR. MAGNESIUM ALLOYS ALSO HAVE BEEN CONSIDERED FOR AEROSPACE APPLICATIONS BECAUSE OF THEIR LIGHT WEIGHT. HOWEVER, THEIR POOR CORROSION RESISTANCE AND MECHANICAL BEHAVIOR HAVE RESTRICTED THEIR USE. FURTHER WEIGHT REDUCTION OF Ti ALLOYS AND IMPROVEMENT IN CORROSION AND MECHANICAL BEHAVIOR OF Mg ALLOYS REQUIRE RESEARCH OF NEW ALLOYS BASED ON THESE MATERIALS. IT IS PROPOSED TO MEET THESE OBJECTIVES BY DEVELOPING Ti-Li, Ti-Mg, Mg-Cr AND mG-Al ALLOYS. CONVENTIONAL ALLOYING TECHNIQUES CANNOT BE APPLIED TO FABRICATE MOST OF THE PROPOSED ALLOYS OVER A COMPOSITION RANGE. THEREFORE, A NOVEL TECHNIQUE BASED ON VAPOR DEPOSITION AND SUBSEQUENT ION IRRADIATION HAS BEEN PROPOSED. IT IS EXPECTED THAT THIS TECHNIQUE WILL ENABLE THE FABRICATION OF THE PROPOSED ALLOYS WITH AN AMORPHOUS OR FINE GRAIN MICROSTRUCTURE. TRANSMISSION ELECTRON MICROSCOPY WILL BE USED TO ANALYZE THE MICROSTRUCTURAL DETAILS. POTENTIODYNAMIC POLARIZATION MEASUREMENTS WILL BE CARRIED OUT ON FABRICATED Mg ALLOY FILMS FOR EVALUATION OF THEIR CORROSION BEHAVIOR.

UNIVERSAL ENERGY SYSTEMS INC
3518 RIVERSIDE DR - STE 207
UPPER ARLINGTON, OH 43221
CONTRACT NUMBER: F33615-87-C-5302
R DICK/J RAMANATHAN
TITLE:
KNOWLEDGE-BASED ASSISTANCE FOR THE CONTROL AND USE OF MANUFACTURING SOFTWARE SYSTEMS
TOPIC# 107 OFFICE: AFWAL/ML

MANUFACTURING ORGANIZATIONS EMPLOY A LARGE BODY OF KNOWLEDGE IN DESIGNING AND MANUFACTURING A PRODUCT. THE TOTAL KNOWLEDGE INVOLVED IN THIS PROCESS IS: -DISTRIBUTED IN DIVERSE ELEMENTS SUCH AS TRADITIONAL SOFTWARE TOOLS, EXPERT SYSTEM TOOLS, DATABASES, MANUALS, AND EXPERT PROJECT MEMBERS, -INHOMOGENEOUS IN NATURE, RANGING FROM DESCRIPTIVE TO PRESCRIPTIVE, MANAGERIAL TO TECHNICAL, AND SHALLOW TO DEEP. CONSEQUENTLY, THE APPLICATION OF THIS KNOWLEDGE IS VERY SUSCEPTIBLE TO DIFFERENT AND INACCURATE INTERPRETATIONS BY DIFFERENT ENGINEERS AND POSES A SERIOUS PRODUCTIVITY PROBLEM. WE PROPOSE TO DESIGN A COMPUTER-BASED, LIFE-CYCLE USER ASSISTANT WHICH HAS THE FOLLOWING CHARACTERISTICS: -INTERVENES BETWEEN THE USER, TOOLS AND DATABASES AND UNDERSTANDS HOW TO ASSIST THE USER IN FOLLOWING A LIFE-

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CYCLE METHOD FOR DESIGN-IN-THE-LARGE, -BRINGS TO THE USER'S ATTENTION THE APPLICABLE MANUFACTURABILITY CONSTRAINTS, -EXPLOITS AND ENGINEERS THE OF USE TECHNIQUES FOR ARTIFICAL INTELLIGENCE, DATA BASES AND OPERATING SYSTEMS, -HARNESS AVAILABLE SOFTWARE DEVELOPED UNDER THE IISS PROGRAM, AND -FACILITATES LIFE-CYCLE SUPPORT FOR MANUFACTURING DOMAINS SUCH AS FORGING, EXTRUSION, ETC. THE DELIVERABLES OF THE PROPOSED PROJECT ARE 1) AN ARCHITECTURE OF THE KNOWLEDGE INTEGRATION SHELL (KI-SHELL) BASED ON IISS SOFTWARE AND 2) A PLAN TO BRING UP A KNOWLEDGE-BASEDASSISTANT FOR THE SPECIFIC TEST-BED DOMAIN OF DIE DESIGN FOR METAL EXTRUSION.

UNIVERSAL POLYMERS CORP
1501 - 109TH ST
GRAND PRAIRIE, TX 75050
CONTRACT NUMBER:
MATTHEW LIU
TITLE:
PROTECTIVE DUCT COATING
TOPIC# 27 OFFICE: AEDC/DOT

ARNOLD ENGINEERING DEVELOPMENT CENTER (AEDC), USAF, TULLAHOMA, TN, HAS APPLIED VARIOUS ANTI-CORROSION COATING MATERIALS ON THE INTERIOR SURFACE OF THEIR AIR DUCT SYSTEMS TO PREVENT RUST FORMATION WHICH HAS BECOME A MAJOR PROBLEM DUE TO HIGH AIR MASS FLOWS AT TEMPERATURE EXTREMES FROM 120 DEG. F TO 600 DEG. F AND TO HIGH RELATIVE HUMIDITY. THESE ATTEMPTS BY AEDC HAVE HAD ONLY LIMITED SUCCESS WITH THESE COATINGS. ATTEMPTS TO PROCURE COMMERCIAL COATINGS HAVE NOT BEEN SUCCESSFUL BECAUSE COATINGS THAT WILL MEET ALL OF THE CRITERIA ARE NOT AVAILABLE IN THE CURRENT MARKET. THIS PROPOSAL DISCUSSES A NOVEL APPROACH TO FORMULATE A COATING SYSTEM THAT WILL MEET AEDC'S END-USE APPLICATION AND PERFORMANCE REQUIREMENTS. MATERIAL SELECTION CRITERIA, FORMULATION PROCESSING, METHOD OF TESTING, AND QUALIFICATION WILL ALSO BE DISCUSSED.

UNIVERSAL TECHNOLOGY CORP (UTC)
1270 N FAIRFIELD RD
DAYTON, OH 45432
CONTRACT NUMBER: F33615-87-C-5309
WILLIAM M HENGHOLD
TITLE:
LOW COST UNIFIED EXPERT SYSTEM TOOL FOR MANUFACTURING
TOPIC# 108 OFFICE: AFWAL/ML

SUBMITTED BY

THE POSITIVE IMPACT OF EXPERT SYSTEMS UPON MANUFACTURING CAN BE HEIGHTENED BY ELIMINATION OF SOME OF THE IMPEDIMENTS OF THE KNOWLEDGE ENGINEERING PROCESS. THIS PROPOSAL FEATURES THE USE OF LOW-COST PERSONAL COMPUTERS, COGNITIVE PSYCHOLOGY AND KNOWLEDGE-RICH EXPERT SYSTEMS TO DEMONSTRATE THE FEASIBILITY OF A UNIFIED (ACQUISITION, REFINEMENT AND DELIVERY) EXPERT SYSTEM TOOL. SUCH A TOOL CAN BE WIDELY APPLIED IN THE MANUFACTURING ARENA. A DEMONSTRATION TOOL WILL BE DEVELOPED AND PUT TO LIMITED CASE USE, SPECIFIC TO THE MANUFACTURING ENVIRONMENT. THIS WILL ALLOW FOR FURTHER STUDY OF THE ISSUES PREPARATORY TO A PHASE II EFFORT.

VATELL CORP
PO BOX 66
CHRISTIANSBURG, VA 24073
CONTRACT NUMBER: F33615-87-C-2802
LAWRENCE W LANGLEY
TITLE:
TIP CLEARANCE SIGNAL PROCESSOR DEVELOPMENT
TOPIC# 138 OFFICE: AFWAL/PO

VATELL CORPORATION WILL DESIGN, ASSEMBLE AND TEST A BREADBOARD SIGNAL PROCESSING MODULE FOR ON-LINE, REAL-TIME COMPUTATION OF TURBOMACHINE BLADE CLEARANCE AND TIME OF ARRIVAL. THE MODULE WILL PROCESS SIGNALS FROM THE VATELL PROBE, A NEW TYPE OF EDDY-CURRENT PROXIMITY SENSOR. CLEARANCE AND TIME OF ARRIVAL VALUES WILL BE COMPUTED FOR EACH INDIVIDUAL BLADE AND COMMUNICATED TO A HOST COMPUTER. THE BREADBOARD SYSTEM WILL BE TESTED WITH THE VATELL PROBE ON A PRATT & WHITNEY JT15-D FAN STAGE AT VIRGINIA POLYTECHNIC INSTITUTE, THEN DELIVERED TO THE AIR FORCE FOR FURTHER TESTS OR USE.

VATELL CORP
PO BOX 66
CHRISTIANSBURG, VA 24073
CONTRACT NUMBER: F33615-87-C-2801
LAWRENCE W LANGLEY
TITLE:
TIP SENSOR DEVELOPMENT
TOPIC# 138 OFFICE: AFWAL/PO

SUBMITTED BY

THIS PROPOSAL IS FOR DEVELOPMENT OF SENSORS FOR TURBOMACHINERY BLADE CLEARANCE AND TIME OF ARRIVAL, BASED ON NOVEL EDDY-CURRENT SENSING TECHNOLOGY ORIGINATED BY VATELL CORPORATION. THE NEW SENSING TECHNOLOGY MAY RESULT IN SIGNIFICANT BANDWIDTH IMPROVEMENTS FOR BOTH CLEARANCE AND TIME MEASUREMENTS. PROTOTYPE SENSORS RATED FOR 200 GEGREES CENTIGRADE WILL BE FABRICATED AND TESTED ON THE FIRST STAGE FAN OF A PRATT & WHITNEY JT15-D TURBOJET ENGINE IN THE VIRGINIA TECH TURBOMACHINERY LABORATORY. EXPERIMENTAL DATA WILL BE USED TO ESTABLISH EMPIRICAL VALUES IN A MATHEMATICAL MODEL OF THE RELATIONSHIPS BETWEEN SPEED, CLEARANCE AND SENSOR SIGNAL AMPLITUDE. TEST RESULTS WILL BE REPORTED AND PROTOTYPE SENSORS WILL BE DELIVERED TO THE AIR FORCE FOR USE OR TESTING.

VATELL CORP
PO BOX 66
CHRISTIANSBURG, VA 24073
CONTRACT NUMBER: F33615-87-C-2164
LAWRENCE W LANGLEY
TITLE:
CIRCULAR AIRPLANE INVESTIGATION
TOPIC# 160 OFFICE: ASD/XR

LIFT AND CONTROL CHARACTERISTICS OF A CIRCULAR AIRPLANE EMPLOYING THE COANDA EFFECT WILL BE INVESTIGATED EXPERIMENTALLY AND ANALYTICALLY. A SCALE MODEL WILL BE CONSTRUCTED, INSTRUMENTED AND TESTED FOR LIFT FORCES, VELOCITY AND PRESSURE PROFILES. A FINITE DIFFERENCE METHOD OF ANALYSIS OF THE FLOW OVER THE BODY WILL BE DEVELOPED, USING A PARABOLIC MARCHING TECHNIQUE AND A MIXING LENGTH MODEL WITH EMPIRICAL CORRECTIONS. THE EXPERIMENTAL DATA WILL BE USED TO CORRECT THE ANALYTICAL MODEL. CONTROLLED SEPARATION OF THE AXISYMMETRIC COANDA JET WILL BE INVESTIGATED AS AN ATTITUDE CONTROL MEANS.

VERAC INC
9605 SCRANTON RD - STE 500
SAN DIEGO, CA 92121
CONTRACT NUMBER: 87-C-0332
PETER THOMPSON
TITLE:
BOMB TERMINAL GUIDANCE INVESTIGATION
TOPIC# 2 OFFICE: AD/XRX

SUBMITTED BY

THE PROPOSED EFFORT ADDRESSES AN EXTENSION OF THE INERTIAL GUIDANCE TEST DEMONSTRATION (IGTD) PROGRAM, WHICH CONSISTS OF THE INTEGRATION OF A LOW COST INERTIAL GUIDANCE UNIT WITH A MK-82 BOMB, TO INCLUDE A TERMINAL SEEKER. THE STUDY FOCUSES ON THE SYNERGISM BETWEEN INERTIAL GUIDANCE AND TERMINAL GUIDANCE, PARTICULARLY THE REDUCTION IN SEARCH AREA AND RANGE-TO-TARGET REQUIREMENTS ASSOCIATED WITH TERMINAL SENSOR ACQUISITION. THE INVESTIGATION ALSO TAKES ADVANTAGE OF THE ADVENT OF THE GLOBAL POSITIONING SYSTEM, TO BE AVAILABLE IN AIR FORCE LAUNCH AIRCRAFT IN THE 1990s. THE PRINCIPAL STUDY TASKS ARE THE FOLLOWING: IDENTIFICATION OF TARGETS; SELECTION OF DELIVERY VEHICLE(S) AND ATTACK MODES; SELECTION OF TERMINAL GUIDANCE CONCEPTS AND DEFINITION OF COSTS; PERFORMANCE/COST ANALYSES, AND PHASE II PLANNING.

VERAC INC
9605 SCRANTON RD - STE 500
SAN DIEGO, CA 92121
CONTRACT NUMBER: 87-C-0294
PAUL C WILFONG
TITLE:
INVESTIGATION OF PRECISION TRACKING PLATFORM FOR PORTA
TOPIC# 9 OFFICE: AFATL/ASI

THE PROPOSED INVESTIGATION POSTULATES SEVERAL CANDIDATE CONCEPTS FOR A PORTABLE TIME-SPACE-POSITION-INFORMATION (TSPI) SYSTEM, EVALUATES EACH CANDIDATE AND SELECTS ONE OR MORE CONCEPTS WHICH SATISFY AIR FORCE COST AND PERFORMANCE REQUIREMENTS. THE INVESTIGATION ALSO EXAMINES ADVANCED REAL-TIME TSPI DATA PROCESSING TECHNIQUES AND SPECIAL PURPOSE COMPUTER ARCHITECTURES FOR IMPLEMENTING ADVANCED TRACKING ALGORITHMS. THIS STUDY ALSO INCLUDES THE USE OF GLODAL POSITIONING SYSTEM (GPS) AND ADVANCED INSTRUMENTATION CALIBRATION TECHNIQUES (E.G., STAR CALIBRATION). THE PRINCIPAL DRIVERS FOR THE STUDY ARE LIMITATIONS IN THE CAPABILITIES OF CURRENT FIXED BASE INSTRUMENTS. THESE LIMITATIONS INCLUDE DEGRADED COVERAGE AND ACCURACY AT LOW ALTITUDE, WHICH LIMITS THEIR USEFULNESS FOR TESTING AT REMOTE SITES.

VERAC INC
9605 SCRANTON RD - STE 500
SAN DIEGO, CA 92121
CONTRACT NUMBER: F33615-87-1475
DR PAUL M KEMP
TITLE:
ASSESSMENT OF TRANSFER ALIGNMENT TECHNIQUES FOR HYPERS
APPLICATIONS
TOPIC# 150 OFFICE: AFWAL/AA

SUBMITTED BY

THIS EFFORT ADDRESSES THE ISSUES OF GUIDANCE AND NAVIGATION FOR A NEW FAMILY OF STRATEGIC WEAPONS TO BE DELIVERED FROM HYPERSONIC VEHICLES. THE SPECIFIC FOCUS OF THE INVESTIGATION IS TRANSFER ALIGNMENT OF THE WEAPON INERTIAL NAVIGATION SYSTEM FROM THAT OF THE HYPERSONIC CARRIER VEHICLE. INITIAL EFFORT WILL BE THE DEFINITION OF TRANSFER ALIGNMENT ACCURACY REQUIREMENTS, DERIVED FROM WEAPON CEP REQUIREMENTS, TERMINAL SENSOR ACQUISITION BASKET SIZE REQUIREMENTS, AND THE PERFORMANE CAPABILITIES OF THE WEAPON INERTIAL GUIDANCE SYSTEM DURING ITS MID-COURSE GUIDANCE PHASE. TRANSFER ALIGNMENT REQUIREMENTS WILL BE COMPARED TO TRANSFER ALIGNMENT PERFORMANCE ACHIEVABLE WITH EXISTING TECHNIQUES IF EMPLOYED IN A HYPERSONIC VEHICLE ENVIRONMENT. SHORTCOMINGS OF EXISTING TECHNIQUES WILL BE IDENTIFIED, AND ANALYTICAL INVESTIGATION OF ALTERNATIVE TECHNIQUES WILL BE PURSUED. THE END PRODUCT OF THE INVESTIGATION WILL BE THE ASSESSMENT OF CRITICAL INERTIAL GUIDANCE ISSUES FOR WEAPONS DELIVERED FROM HYPERSONIC VEHICLES, AND A PROPOSAL FOR FURTHER DEFINITIZATION OF ADVANCED WEAPON CONCEPTS TO BE PERFORMED AS A PHASE II SBIR EFFORT.

VERAC INC
9605 SCRANTON RD - STE 500
SAN DIEGO, CA 92121
CONTRACT NUMBER: F33615-87-C-2137
BRUCE CAMPBELL
TITLE:
AERONAUTICAL SYSTEMS/SUBSYSTEMS RESEARCH
TOPIC# 160 OFFICE: ASD/XR

THIS STUDY DEVELOPED THE METHODOLOGY FOR DESIGNING A PROPULSION EXPERT ASSESSMENT TOOL (PEAT). THE CONTRACT TASKS CONSISTED OF DATA SOURCE IDENTIFICATION/COLLECTION AND INTERVIEWING EXPERTS. THE EXPERTS INTERVIEWED WERE FROM INDUSTRY (DESIGN ENGINEERS), LOGISTICIANS AND OPERATIONAL PERSONNEL. A FEASIBILITY DEMONSTRATION WAS COMPLETED USING OBASE III PLUS ALONG WITH RULES ESTABLISHED BY THE EXPERTS FOR A LIMITED PORTION OF THE DATA. THIS ASSESSMENT TOOL WILL ENHANCE THE DECISION MAKING PROCESS OF DESIGN ENGINEERS AND PROGRAM MANAGERS BY INTEGRATING KNOWLEDGE-RULES OF DESIGN ENGINEERS, OPERATIONAL PERSONNEL, LOGISTICIANS AND PROGRAM MANAGERS.

VERITAY TECHNOLOGY INC
PO BOX 305 - 4845 MILLERSPOT HWY
EAST AMHERST, NY 14051
CONTRACT NUMBER: 87-C-0419
EDWARD B FISHER
TITLE:
ARMAMENT RESEARCH - GUN GAS CONTROL TECHNOLOGY
TOPIC# 1 OFFICE: AFATL/MNG

SUBMITTED BY

RAPID-FIRE, HIGH VELOCITY GUN SYSTEMS ARE SUBJECT TO PROBLEMS SUCH AS EXCESSIVE MUZZLE PRESSURE, BLAST, AND SECONDARY FLASH. THESE PROBLEMS OCCUR BECAUSE NEARLY SEVENTY PERCENT OF THE PROPELLANT CHEMICAL ENERGY, REMAINS IN THE GAS IN THE FORM OF THERMAL AND KINETIC ENERGY. THE AFOREMENTIONED PROBLEMS ARE A DIRECT RESULT OF THIS ABUNDANCE OF HOT, HIGH-PRESSURE GAS THAT IS RAPIDLY VENTED FROM THE BARREL. THE KEY TO ALLEVIATING THIS PROBLEM IS TO DIVERT GAS FROM THE BARREL SO THAT THE GAS CONDITIONS AT THE BARREL EXIST HAVE BEEN EXPANDED TO LOWER PRESSURE, REDUCED TEMPERATURE AND LESS OVERALL KINETIC ENERGY. THE DIVERTED GAS IS THEN DISPERSED SEPARATELY SO THAT THE VOLUME AND, THEREFORE, THE ENERGY DENSITY OF THE EXHAUST GAS IS DECREASED TO LEVELS THAT ELIMINATE SEVERE BLAST AND FLASH. VERITAY PROPOSESD TO DEVELOP THE METHODOLOGY FOR PREDICTING FLOW CONDITIONS, PROBLEM ASSESSMENT, AND DESIGN DEVELOPMENT. FOUR DESIGN CONCEPTS WILL BE FORMULATED AND EVALUATED, THREE THAT DIVERT GAS AT THE MUZZLE AND THE OTHER THAT DIVERTS GAS AT THE BREECH. THE MOST PROMISING AND WORKABLE CONCEPT WILL BE SELECTED FOR EXPERIMENTAL DEVELOPMENT DURING PHASE II.

VERITAY TECHNOLOGY INC
PO BOX 305 - 4845 MILLERSPORT HWY
EAST AMHERST, NY 14051
CONTRACT NUMBER:
GERALD A STERBULTZEL
TITLE:
TWENTY-FIRST CENTURY PROPULSION CONCEPTS
TOPIC# 192 OFFICE: AFRPL/TSTR

THE OBJECTIVE OF THE PROPOSED PROGRAM IS TO INVESTIGATE AND QUANTIFY IN A LABORATORY VACUUM ENVIRONMENT THE PERFORMANCE OF A KNOWN BUT INADEQUATELY EXPLORED CONCEPT FOR CONVERTING ELECTROSTATIC FIELD ENERGY DIRECTLY INTO A PROPULSIVE FORCE. THE CONCEPT MAY REPRESENT A DIRECT FIELD-VACUUM INTERACTION SCHEME WITH THE POTENTIAL FOR PRODUCING THRUST WITHOUT THE CONVENTIONAL EJECTIVE EXPENDITURE OF AN ONBOARD FUEL.

VISTA RESEARCH INC
PO BOX 51820 - 3600 W BAYSHORE RD
PALO ALTO, CA 94303
CONTRACT NUMBER:
DR ALAN A BURNS
TITLE:
AN ON-BOARD PASSIVE TECHNIQUE FOR MEASURING ELECTRON D
MODEL BOUNDARY LAYERS
TOPIC# 214 OFFICE: BMO/MYSC

SUBMITTED BY

THIS NOVEL AND INNOVATIVE TECHNIQUE EMPLOYS ON-BOARD HARMONIC AND INTERMODULATION-PRODUCT FREQUENCY GENERATION TO PROVIDE RF SIGNALS THAT CAN BE USED TO MEASURE ELECTRON DENSITIES IN THE LAMINAR AND TURBULENT BOUNDARY LAYERS ON A HYPERSONIC MODEL. THE ONLY ON-BOARD COMPONENT(S) IS (ARE)A MICROWAVE DIODE(S) FROM THE HARMONIC AND INTERMODULATION PRODUCT GENERATIONS. EXCITING SIGNALS ARE SUPPLIED BY RF SOURCES ILLUMINATING THE MODEL.

WEIDLINGER ASSOCS
620 HANSEN WY - STE 100
PALO ALTO, CA 94304
CONTRACT NUMBER:
GREGORY L WOJCIK
TITLE:
A PROPOSAL TO EVALUATE CAPABILITIES OF SOVIET PASSIVE DESIGNS
TOPIC# 222 OFFICE: BMO/MYSC

THIS IS A PROPOSAL TO USE ARRAY PROCESSING TECHNIQUES IN CONJUNCTION WITH SEISMO-ACOUSTIC WAVE MODELING TO EVALUATE THE ABILITY TO LAND-BASED PASSIVE SENSOR ARRAYS TO LOCATE MULTIPLE SOURCES IN THE PRESENCE OF BACKGROUND NOISE, COMPLEX SIGNAL TRAVEL PATHS, AND MULTIPLE WAVE TYPES AND POLARIZATIONS. THE PRIMARY PURPOSE IS TO DESIGN AND NUMERICALLY QUALIFY SENSOR ARRAYS THAT MINIMIZE DETECTION THRESHOLD AND MAXIMIZE DISCRIMINATION ON A VARIABLE NUMBER OF STATIONARY OR MOVING SOURCES. THE SECOND PURPOSE IS TO EVALUATE CAPABILITIES OF OBSERVED SEISMIC AND ACOUSTIC SOVIET ARRAYS GIVEN THEIR GEOMETRY, PROBABLE INSTRUMENTATION, AND DESIGN SOURCE TYPE. RECENT ADVANCES IN GENERAL ARRAY PROCESSING ALGORITHMS YIELD NEW, ROBUST METHODS CAPABLE OF INCLUDING MULTIPLE SOURCES, ARBITRARY ARRAY GEOMETRIES, AND DIFFERENT POLARIZATIONS, ALL FROM A UNIFIED MATHERMATICAL BASIS. IN ADDITION, MODERN ACOUSTIC AND SEISMIC WAVE SOLVERS PROVIDE PRACTICAL NUMERICAL TOOLS FOR SIMULATING WAVE PROPAGATION IN THE GEOPHYSICAL ENVIRONMENT. TOGETHER, ARRAY PROCESSING AND WAVE SIMULATION TECHNIQUES ARE PRECISELY THE TOOLS NECESSARY TO DESIGN AND EVALUATE SEISMO-ACOUSTIC ARRAYS. THE OUTCOME OF THIS RESEARCH WILL BE AN EVALUATION OF ARRAY EFFECTIVENESS FOR A VARYING NUMBER OF SEPARATED MULTIPLE SOURCES, DETECTION POWER REQUIREMENTS, AND RELIABILITY WITH RESPECT TO ENVIRONMENTAL FACTORS.

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WICKMAN SPACECRAFT & PROPULSION CO
8428 LOST CAVERN CT
CITRUS HEIGHTS, CA 95621
CONTRACT NUMBER:
JOHN H WICKMAN
TITLE:
PHASE STABILIZED AMMONIUM NITRATE FOR SOLID ROCKET PRO
TOPIC# 187 OFFICE: AFRPL/TSTR

THIS STUDY WILL IDENTIFY ADDITIVES FOR AMMONIUM NITRATE TO SPECIFICALLY PHASE STABILIZE IT FOR USE IN SOLID ROCKET PROPELLANTS. THE ADDITIVES WILL BE BOTH ORGANIC AND INORGANIC MATERIALS. PRELIMINARY SCREENING TESTS WILL BE CONDUCTED USING A DIFFERENTIAL SCANNING CALORIMETER. THESE TESTS WILL BE FOLLOWED BY TEMPERATURE CYCLING OF CYLINDRICAL SPECIMENS. THOSE CANDIDATES PASSING THE PRELIMINARY SCREENING TESTS WILL BE USED IN PROPELLANTS WHICH WILL BE SUBJECTED TO STRAND BURNING RATE TESTS. AN OPTION HAS BEEN PRESENTED TO ALSO CONDUCT AGING AND MECHANICAL PROPERTY TESTS ON THE PSAN SAMPLES. BURNING RATE CATALYSTS WILL BE EXPLORED TO INCREASE THE BURNING RATES OF THE CANDIDATE PSANS.

XI MAGNETICS INC
RD 4 - BOX 457
COATESVILLE, PA 19320
CONTRACT NUMBER: F33615-87-C-5312
DR JOHN L WALLACE
TITLE:
VERY HIGH TEMPERATURE/VERY HIGH FREQUENCY MAGNETIC MAT DEVELOPMENT
TOPIC# 106 OFFICE: AFWAL/ML

IN THIS PROJECT WE WILL EXPAND UPON THE EXISTING TECHNOLOGY OF MULTILAYER MAGNETIC THIN FILM COMPOSITES TO DEVELOP A PSEUDO-BULK MATERIAL WITH STABLE MAGNETIC PROPERTIES OVER THE ENTIRE 0 TO > 600 DEG C TEMPERATURE RANGE. THE SATURATION MAGNETIZATION AND PERMEABILITY OF THIS MATERIAL AT 600 DEG C SHOULD BE AT LEAST ONE ORDER OF MAGNITUDE BETTER THAN THE ROOM TEMPERATURE VALUES OF COMPETING FER-

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RITES. THE TEMPERATURE STABILITY AND HIGH FREQUENCY RESPONSE OF THIS MATERIAL WILL ALSO BE MUCH BETTER THAN THAT OF LAMINATED METGLAS COMPOSITES. IN PHASE I, WE WILL PRODUCE LABORATORY SAMPLES OF THE VERY HIGH TEMPERATURE MATERIAL AND WE WILL DESIGN AND CONSTRUCT A MEASUREMENT SYSTEM TO DO RAPID, PRECISE, SEMI-AUTOMATIC CHARACTERIZATIONS OF THE CONSTITUTIVE PARAMETERS AS FUNCTIONS OF TEMPERATURE AND FREQUENCY BETWEEN 100 - 900 MHz AND BETWEEN 20 - 600 DEG C.

XON-TECH INC
6862 HAYVENHURST AVE
VAN NUYS, CA 91406
CONTRACT NUMBER:
GEORGE E BOHANNON
TITLE:
ANTI-SIMULATION DEVICES
TOPIC# 218 OFFICE: BMO/MYSC

THE PHASE I EFFORT WILL ADDRESS THE DEVELOPMENT OF ANTISIMULATION DEVICES FOR DENYING RV-DECOY DISCRIMINATION BASED ON PRECISION MOTION MEASUREMENTS AND CERTAIN RCS DISCRIMINANTS. THE FEASIBILITY OF DEVELOPING SMALL ELECTRONICALLY CONTROLLED SCATTERING DEVICES WILL BE ESTABLISHED, INCLUDING THE IDENTIFICATION OF CANDIDATE DESIGNS. VEHICLE EXTERIOR SHAPES WHICH ENHANCE THE PERFORMANCE OF THE ANTI-SIMULATION DEVICES WILL BE IDENTIFIED. A DETAILED PROCEDURE FOR EVALUATING THE PERFORMANCE OF THE DEVICES IN TERMS OF THEIR ABILITY TO DENY DISCRIMINATION WILL BE GENERATED. THESE PROCEDURES WILL INVOLVE REALISTIC SIGNATURE AND MEASURMENT SIMULATIONS. FINALLY, A DETAILED MEASUREMENT PLAN WILL BE GENERATED TO VERIFY THE OPERATING CHARACTERISTICS OF THE DEVICES AND TO RESOLVE UNCERTAINTIES IN THE THEORETICAL PREDICTIONS.

bd SYSTEMS INC
357 VAN NESS WY - STE 110
TORRANCE, CA 90501
CONTRACT NUMBER:
WARREN B STEVENS
TITLE:
MOBILE MISSILE TEL ANALYSIS
TOPIC# 203 OFFICE: BMO/MYSC

SUBMITTED BY

THE PROPOSED PHASE I STUDY WILL FIRST DETERMINE THE ESSENTIAL ELEMENTS OF INFORMATION FOR MOBILE MISSILE VEHICLE ANALYSIS. OBJECTIVES FOR PHASE I ARE 1) DEFINE AN INNOVATIVE METHODOLOGY FOR MAKING ACCURATE INTELLIGENCE ASSESSMENTS FROM LIMITED DATA AND 2) PROTOTYPE A SUBSET OF THE METHODOLOGY TO DEMONSTRATE FEASIBILITY OF BUILDING A METHODOLOGY TOOL. THE GOAL WILL BE TO DESIGN A METHODOLOGY THAT CAN USE INCOMPLETE INFORMATION OR DATA WITH DIFFERENT LEVELS OF CONFIDENCE YET REACH CONCLUSIONS. AN ABILITY TO EXPLAIN THE REASONING PROCESS THAT WAS USED TO REACH CONCLUSIONS WILL ALSO BE SUPPORTED BY METHODOLOGY TOOL. PHASE I EFFORT WILL INCLUDE A TRADE-OFF BETWEEN ALGORITHMIC AND HEURISTIC APPROACHES TO IMPLEMENTING THE METHODOLOGY IN SOFTWARE. THE SELECTED METHODOLOGY FROM PHASE I WILL BE PROPOSED FOR IMPLEMENTATION IN PHASE II AS A SOFTWARE-RESIDENT TOOL.

AF

TOTAL NUMBER OF AWARDS: 350

END

DATE

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